there was vigorous discussion and deliberation in the Diet (parliament). Moreover, large industrial groups outside of the information industry, among them Mitsui, Mitsubishi, and Sumitomo, established "information syndicates" to examine, "join hands with manufacturers, banks and traders," and act upon the business opportunities and the implications of information technology for the industrial structure during the 1970s and beyond. The White Paper" predicted that these syndicates will have a great influence on the changes in Japan's industrial structure of the country.

As early as 1969, the Industrial Structure Council of the Ministry of International Trade and Industry (MITI) had diagrammed what it called the information industry, whose three principal divisions are: the information industry(data supply and information processing services), Data processing related indsutries (computer and related industires, software industries, and related service industries), and the knowledge industry (mass communications, education, research and development, lawyers and accountants). (See the diagram on the next page for the details.) The White Paper describes the efforts of the Japanese to catch up with the United States and Germany in the 1950s and 1960s in the computer field, hardware and software.

To organize better the effort, a number of goals were set forth. First, to make Japan essentially self-sufficient and competitive in computer hardware and software production and usage. Also to develop an informationalized society at home and participate in its development abroad. MITI would play a coordinating role here. Second, to hasten the spreading and deepening of this potential capability by specifying and nurturing the essential relationships between large and small businesses, and between business, government and education; by promoting standardization, and a necessary reporting and assessment capability essential to such an undertaking. Third, to formulate policies essential to the health of the computer industry and to the promotion of an information society. The outline of policies for promotion of computerization is also provided in a subsequent page. The White Paper underscores the value (and the uniqueness) of creating "information syndicates" that in their self interest will stimulate progress on a national scale. It also recognizes that close contact must be maintained with

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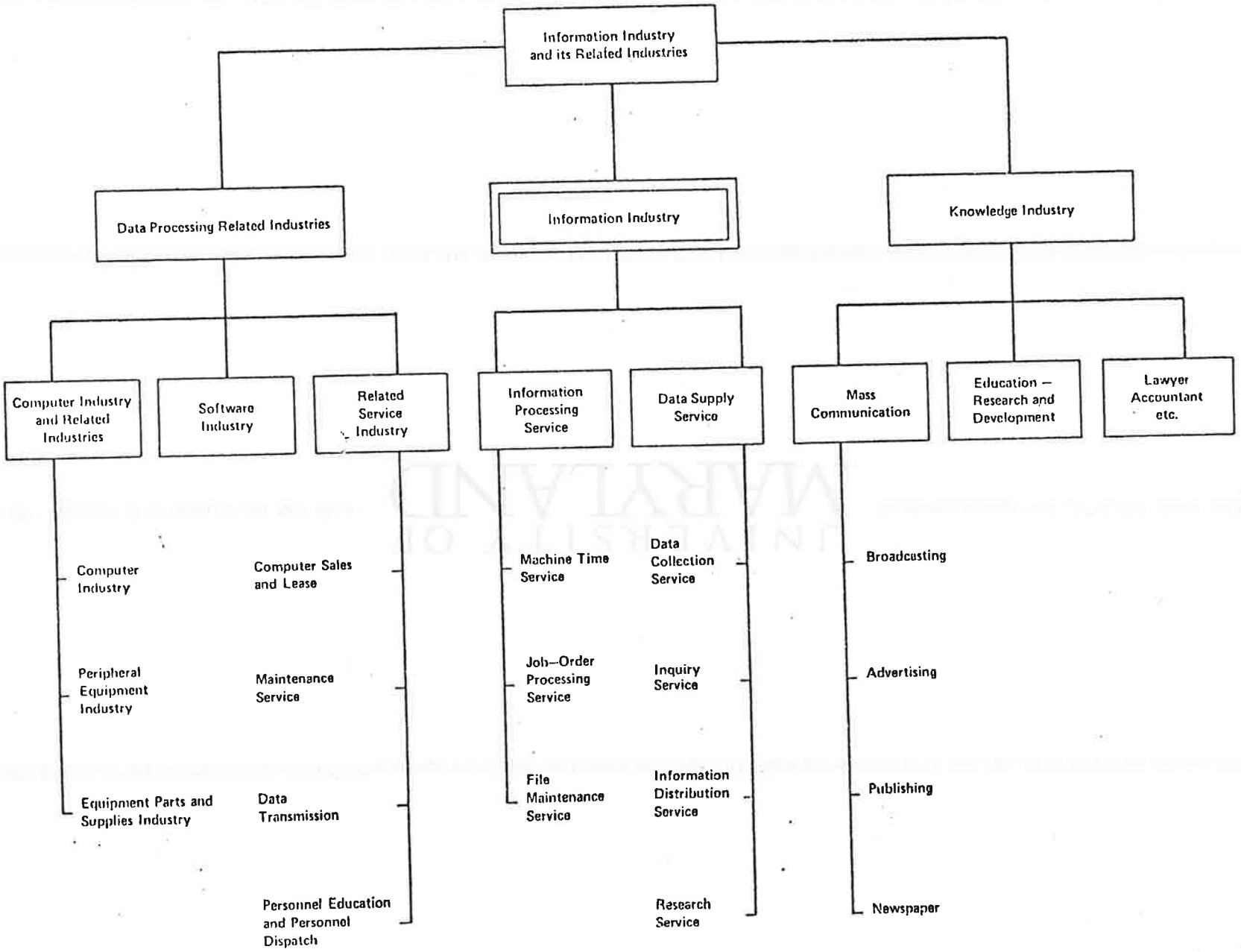
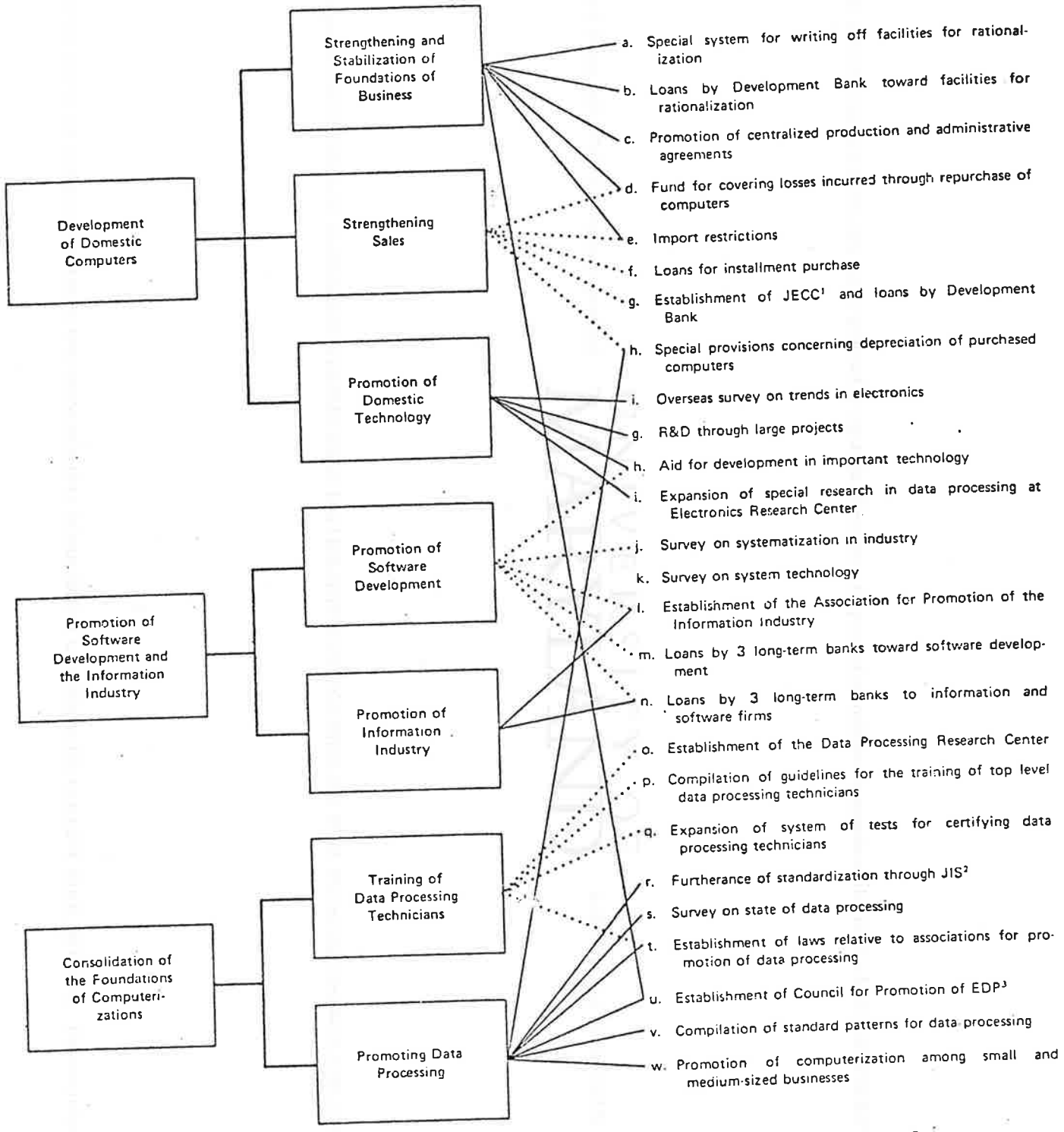
Information Industry and Its Related Industries



Outline of Policies for Promotion of Computerization



[1] JECC – Japan Electronic Computer Company
[2] JIS – Japan Industrial Standards
[3] EDP – Electronic Data Processing

1.9

key groups in the United Nations, the Organization for Economic Cooperation and Development, and similar international groups involved in information programs. The White Paper recognizes that there is a systematic need for problem-solving and crisis management efforts that will take advantage of information management tools and techniques. The formation of information syndicates by large industrial groups may contribute to the resolution of problems and issues of a national scale. A considerable input is made towards the improvement of education and training of managers and others for the information society. The Japan Ministry of Education is making a special effort to facilitate computer usage by the nation's universities. The paper quite explicitly recognizes that the Japanese government by virtue of its size and responsibilities must exercise considerable influence over all aspects of the information society, but it must recognize, at the same time, that the private sector will carry a major part of the load. The Federal, regional and local governmental units would all have a role which is spelled out in the White Paper.

In October 1971, Masuda[1] made a summary report on progress of the project.Three bases to envision the Information Society were proposed. The first of these called for the det ermination and possible prevention of social and economic difficulties that may arise, such as the shortage of intellectual manpower and engineers. The second is the underdeveloped state of social-development-oriented information processing technology. The third difficulty are the increasingly critical issues involving the environment, inflation, traffic congestion, population growth especially in urban areas. One thing was becoming clear, the need to develop a new concept of an information society that would displace the current concept based on industrialization or extension of current policies. In the information society there was a need for a "computer-mind" as contrasted with an "industry-mind." Ten concrete targets were proposed. These include: expansion of home terminals, development of a nationwide information network, rationalization of govern-

[1] Masuda, Yoneji, A Vision of Information Society Toward 1980, Japan Computer Usage Development Institute, a Summary of an Interim Report, October 12, 1971. pp 6

ment administration, computer-oriented education, modernization of medical care, control of enviornmental problems, traffic control by automatic vehicle identification, utilization in depth of management information systems, systematizing the distribution channel, and the establishment of the "computer-mind." The summary report insisted that the Japan government establish a time-table for the next ten years. It gave the government the requirement to prepare a core policy for the information society by 1972; to develop a framework for the natiowide information network by 1975; and to compete its administrative data banks presumably by 1975. Such social development programs as the following should be started around 1972-1973: computer-oriented education at at the primary and junior high school level; first aid and rural medical care system; traffic control, fully automated supermarket information systems; and an air and water pollution alarm system. These specifics will give the reader the flavor of what the goals would be for 1980.

It was inevitable that the Japanese government would not be able to meet these schedules. The amount of yen required was far beyond its capabilities to put into such a program. But there was a galvanization of effort in the public and the private sectors, the formulation of goals and objectives, the preparation of plans and milestones, an increase in understanding of the dynamics of the information revolution at all levels, that was unique in the annals of man. The exercise was also a demonstration why the small nation of Japan has been able to stay at the forefront of industry. The failure of the United States to take the subject of the information revolution as seriously as did the Japanese will be a subject that future historians will explore with great relish. Also of interest is the source of the report, the Japan Computer Usage Development Institute, a private organization. While it was taking a holistic, national view of needs, counterpart American computer organizations were focussing their attention on the computer as an instrument for the most part, disregarding the human, social and political aspects of the information revolution. With the passage of years, this computercentric attitude changed, of course, but it was long in coming.

1.9

HERRING REPORT [1]

The Herring Report does not usually get the attention that the other NAS-NAE report, Scientific and Technical Communication--A Pressing National Problem and Recommendations for its Solution, received, but it is a solid contribution worthy of inclusion in this listing of important reports. In addition to Herring, the Task Group consisted of Donald L. Katz, University of Michigan, Clarence Linder, General Electric Co., Jerome D. Luntz, McGraw-Hill Publications, and F. Joachim Weyl, Hunter College.

The study was undertaken at the request of NSF officials, largely because economic conditions at the time were instrumental in tightening budgets, which in turn intensified concern about the costs of publication and the economic health of primary journals. Central in the problem was the current and future role of "page charges", a practice of asking research-supporting institutions to pay costs of articles they submit for publication proportional to the number of pages to be printed. In 1961, the Federal Council for Science and Technology had enunciated the policy that the Federal government would pay charges as a legitimate part of doing research and development, if the services met certain criteria. In 1968, shortages of Federal R&D funds led many institutions that had previously paid page charges to stop the practice, thus alarming the scientific journals dependent on this revenue. The problem led to the study, but the Task Group was asked to look at all sides of the issue in its overall survey of journal economics.

Two groups of recommendations were made, the first dealing with national policies for journal support and directed largely to government agencies; the second group was made to publishers or professional societies, designed to ease their economic problems. Because the problem is a continuing one, the major recommendations are repeated.

> "..Government subsidy of a signficicant part of the costs of publication not only is necessary at the moment, but will continue to be desirable for the overall welfare of science and technology in this country for some time in the future.

[1] Herring, Conyer, et al, Report of the Task Group on the Economics of Information, Committee on Scientific and Technical Information, National Academy of Sciences and National Academy of Engineering, Washington, D.C. 1970. TheReport consisted of 23 pages, but the appendix written by Conyers Herring, A Study of Primary Journal Economics, a unique contribution, takes up an additional 226 pages.

UNISIST REPORT [1]

After a considerable amount of preparation, the UNISIST Conference was convened and chaired by Harrison S. Brown, Foreign Secretary of the National Academy of Sciences (U.S.). It met in Paris, France in October 1971, sponsored by UNESCO and the International Council of Scientific Unions (ICSU). About 85 countries sent about 219 representatives. In addition there were about 80 representatives from about 39 international organizations. It was a large conference addressing a large subject - the feasibility of establishing a world science information system with the acronym UNISIST. To carry out the feasibility study, a UNESCO/ICSU Central Committee was organized in 1967. The 1971 meeting was the culmination of the effort of this group- how to organize the international deployment of the information resources of science, based on a number of principles, such as: unimpeded exchange of published information among all scientists of each country; hospitality to the diversity of disciplines and fields of science and technology as well as diversity of languages; promotion of the interchange of information and data, whether manual or machine; cooperative development of standards to facilitate interchange and compatability; cooperation leading to agreements between and among countries to share workloads; et cetera. The undertaking came to pass because of the genius of Harrison Brown, his tenacity, and his ability to stimulate individuals from different countries to work together for a common goal. It was an achievement for which Brown was lauded all over the world, but less characteristically in his own country, the United States. The period which saw the achievement of the UNISIST goal was one in which the leadership of the United States in international science and technology was at flood tide. It is doubtful if UNISIST could be undertaken today with the same sense of confidence and in a climate of good will that existed only a decade ago. This is not to assert that the United States is

[1] UNESCO and ICSU, Intergovernmental Conference for the Establishment of a World Science Information System, Paris, France, 4-8 October 1971, pp 60.Also published is a UNISIST Synopsis, 92 pages that covers the same material. It was prepared by Scott Adams of the United States.

responsible for the erosion of the cooperative spirit so evident in the early 1970s. The flaring up of the Cold War, the politicizing of the United Nations, and the existence of an economic depression had much to do with the waning of the cooperative spirit manifest a decade ago. But this should not diminish what was accomplished in Paris in 1971. This will now be examined.

First,five key objectives were defined to provide a foundation for the ensuing program: UNISIST should work to:

1. Improve the tools of systems interconnections;

2. Strengthen the functions and improve the performance of the institutional components of the information transfer chain, viz., the libraries and repositories, the abstracting, indexing and translating services, and the information analysis centers;

3. Develop the human resources essential to the planning and operation of future information networks;

4. Help governments provide optimal economic and political environments for the development of systems interconnectibility and cooperation; and

5. Provide assistance to developing countries in planning and developing systems and training personnel to operate them.

Twenty-two recommendations to achieve the above objectives were agreed to, the last of which calls for the formation of an executive office in UNESCO to catalyze the cooperative actions that comprise the UNISIST program. Periodic intergovernmental conference would function to establish policy, set goals, and evaluate progress towards these goals. Each government would be called upon to establish a focal point to interact with UNESCO in the furtherance of the program.

In addition to Harrison Brown, Burton Adkinson of NSF worked hard during the four years prceding the convening of the 1971 meeting. The American delegation was headed by William D. McElroy, Director of the National Science Foundation. Other members were: M. Lewis/Branscomb, Director of the National Bureau of Standards, Harrison S. Brown, National Academy of Sciences, Martin M. Cummings, Director, National Library of Medicine, Melvin S. Day, Head of OSIS, National Science Foundation, Robert A. Harte, Executive Officer, American society of Biological Chemists, Pierre R. Granham, U.S. Permanent Representative to UNESCO, Arnold Kramish, Assistant to Mr. Graham, and Andrew A. Aines, NSF.

As the Executive Secretary of the U.S. delegation, the author has some special memories of this conference: the sheer size of the program, the East-West politics that surfaced before, during and after the conference, the leadership demonstrated by Harrison Brown, the hard work provided by Scott Adams, the skills shown by William McElroy Lew Branscomb, Melvin Day and Martin Cummings in the hard bargaining and other interactions that went on between countries and blocs of countries. It was quite evident that all countries respected (not necessarily admired) the leading status of the United States in science and technology information processes. The militancy and single-mindedness of the the Third World, aided and abetted by the Soviet Union and its bloc, was also in evidence. Stimulating talks were made by Mr. Rene Maheu, Director-General of UNESCO, by Mr. V. Ambartsumian, President of the International Council of Soviet Unions, by M. Pierre Piganiol, whose work in OECD has been reported on in this paper, and by Harrison Brown, talking as a scientist.

In summary, the UNISIST Conference had special significance for several reasons;

1. It brought together the governments of the world to give recognition to the importance of scientific and technical information and communication in the modern world.

2. It signalled to scientific organizations that they no longer maintained a monopoly of leadership in science communications. To the extent that each country was or was trying to harness science and technology to economic and social progress, the flow of scientific and technical information became a matter of high importance and priority in its national affairs.

3. It gave UNESCO the opportunity that it craved, i.e., to get more deeply into international information system development, as well as information interchange.

4. It provided the developing countries with an instrument to assist them achieve progress in their national development.

5. In a sense, it diluted the status of the large, traditional science and technology countries, as well as older science organizations, which up to that time monopolized scientific and technical information exchange processes in the world.

GREENBERGER REPORT [1]

The Greenberger panel was convened in December 1971 to conduct an independent examination of the organization, programs, and possible future roles of the Committee on Scientific and Technical Information (COSATI), Federal Council for Science and Technology, whose chairmanship had been transferred earlier that year from the Office of Science and Technology to the National Science Foundation. The study group was asked to reflect on scientific and technical information programs and policy issues within and outside of the government, including the effects of new developments in computer and communication technology. In addition to Greenberger (The Johns Hopkins University), the panel included: Joseph Becker (Becker and Hayes, Inc.), Harvery Brooks (Harvard University), Walter M. Carlson (IBM), Fred C. Cole (Council on Library Resources), W. Conyers Herring (Bell Telephone Labs), Jerome D. Luntz (McGraw-Hill Publications Compnay), and F. Karl Willenbrock (National Bureau of Standards). Advisors to the panel were William O. Baker (Bell Telephone Laboratories), Caryl Haskins (Washington, D.C.), Herbert A Simon (Carnegie-Mellon University), and Alvin M. Weinberg (Oak Ridge National Laboratory).The Executive Secretary was Stephen A. Rossmassler (National Bureau of Standards), whose role in this study was far more than that of study support.

The panel came up with six premises that it felt would enrich its conclusions and recommendations. They were:

1. To promote healthy development and application of U.S. science and technology, the Federal government has a responsibility to concern itself with the adequacy and effeciveness of the nation's technical information resources.

2. The Federal government has a responsibility to see that the nation's information resources are made generally available in useful and equitable ways to all people who may benefit from their use.

3. Improving the flow of information, internally within science and technology, and outwordly to practitioners who use the results of R&D can be a key to better understanding of societal problems, superior R&D, and for innova-

[1] Greenberger, Martin, et al, Making Technical Information More Useful: The Management of A Vital National Resource, A Report for the Chairman of the Federal Council for Science and Technology, submittee via the Director of the National Science Foundation, Washington, D.C., June 1972, pp 61.

tion and productivity.

4. For improvements in handling information to be meaningful, they must be based on an understanding of how people communicate and how information benefits the persons or organizations being served. Costs related to values derived must be considered. This includes explicit and harder to calculate implicit costs.

5. Scientists,engineers and others have only so much time and capacity to gather and use information. These are precious resources and must receive primary attention if information systems are to realize their promise and justify their cost.

6. The present decentralized array of information systems in the public and private sectors have a pluralistic character similar to the R&D process itself. Effective application of technical knowledge in the treatment of national problems requires improved means for developing national policy on science and technology and in turn scientific and technical information programs.

The validity of these six premises today continues, but unfortunately they are not politically popular in the challenge to the size and scope of Federal government programs today.

In addition to the premises, the panel isolated a number of problem areas that require attention and solution. In summary, they are: unmet needs for information, ineffective information packaging, need for interdisciplinary information, inadequate user involvement, cost effectivenss needs, lack of a market economy, inadequate standardization, unmet utilization of new information technology, lack of interagency coordination, and the lack of a policy for international issues.

The conclusions are recommendations of the panel are as follows:

1. A major redirection of technical information activities is needed, one that will not have an excessive concern with document-handling. one that will place the user in the center of focus of information programs, one that will be more concerned with value derives for investments made, and one that is predicated on the need to recognize the limited time and capacity of users to absorb information.

2. COSATI had been successful in operational aspects of technical information, but not in larger policy areas. It should be succeeded by an Information Policy Board with individuals from the public and private sectors, supported by a full-time staff. There should also be a Federal Technical Information Committee made up of agency representatives to coordinate governmental technical information programs at the operational level and work with and on standards and systems compatability.

3. NSF's Science Information Council should give way to the above, but NSF should develop a high-powered technical and analytical resource to conduct and fund research and policy-oriented analytical studies, furnish all government agencies

with a central consulting service, and be a respository of expertise on the current and potential state-of-the-art in technical information systems.

The Greenberger report has to be considered as one of the most astute undertakings in the national and Federal information field. Its premises are sound, so are its findings and recommendations. Unfortunately, the leaders in the Office of Science and Technology and in the National Science Foundation did little or nothing to implement them. In the following year, the Office of Science and Technology was terminated. The National Science Foundation disregarded the thrust of the Greenberger report, failed to implement its recommendations, and began a process which resulted in the virtually complete abandonment of its own scientific and technical information responsibilities.

WIGINGTON REPORT [1]

In the spring of 1969, a panel of the Computer Science and Engineering Board of the National Academy of Sciences was asked to consider information systems. Work began in 1970 with the sponsorship of the Council on Library Resources. In the Preface, the report recognized the work done by the Baker (1958), Weinberg (1963),SATCOM (1969), and the National Advisory Commission on Libraries (1968) reports, and that in the areas covered by these and other reports involving information handling, the science and engineering community faces a serious challenge to provide tools, techniques, and systems for the solution of some very difficult and important problems.

> "While the potential of computers for handling information has long been recognized, the achievements, over the last several years, seem to be less than desired. Systems are slow in development, expensive in operation, less capable than desired, and generally insufficient to fully satisfy the national needs that have been identified...

The mission of the panel was designed to:

> "Assess the state and trends of computer and related technologies relative to the requirements of library and related information systems; identify the roadblocks to more effective and rapid employment of these technologies for information handling; and focus national level attention on appropriate actions to correct deficiencies identified.

[1] Wigington, Ronald L., et al, Libraries and Information Technology: A National Systems Challenge, A Report to the Council on Library Resources, Inc. by the Information Systems Panel, Computer Science and Engineering Board, National Academy of Sciences, Washington, D.C. 1972, pp 84.

The Panel was made up of Wigington (Director of R&D.Chemical Abstracts Service), the Chairman, F.T. Baker (IBM), Joseph J. Eachus (Honeywell Information Systems), Douglas C. Engelbart),Gerald Salton (Cornell University), James E. Skipper (University of California at Berkeley),and J.F. Kettler, staff officer of the Computer Science and Engineering Board. The Chairman of the Computer Science and Engineering Board was Anthony G. Oettinger (Harvard University).

The Panel found:

> "The primary bar to the development of national computer-based library and information systems is a complex institutional and organizational, human-related set of problems, not computer-based library and information systems. There is also an inadequate economic/value system associated with these activities and a lack of national leadership to solve these problems.
>
> The quantitative contribution of information to productivity or effectiveness of industry, government, and education is unknown, thus the construction of value/cost analyses is severely hampered.
>
> Complete and reliable data on resources expended for library activities and the productive use of existing library facilities are unavailble, thus making national decision-making difficult.
>
> There are difficult problems associated with propery rights to access to and dis distribution of information that must be dealt with.
>
> Useful automation of library processes is evident, especially in large libraries...The prospects for favorable continuing development is excellent

Among its observations and recommendations are the following:

> For improved application of information technology to enhance national information delivery, science policy must assume a much more effective role to weld the various local and regional efforts into a nationally coherent program.
>
> Costs of all services for the U.S. library system should be obtained to facitate planning and decision-making.
>
> The present collection of localized and fragmented efforts must be guided toward harmonious integration through experience with a comprehensive pilot system
>
> To develop information systems consistent with geographic dispersion of information resources and information users, increased stress must be placed on scientific design and modeling studies of broadly-based information networks.

There are other findings, conclusions and recommendations made in the study, but the above provides the direction and flavor of the report. Unlike the previously mentioned Baker, Weinberg and SATCOM reports, which were concerned primarily with the generation,

handling, retrieving, disseminating, and utilizing of scientific and technical information as a national and Federal problem, this study focussed on the overall problem in light of the continued roles of the library and the computer. This is not a critical observation; there continues to be a need for a variety of studies that look at the overall problem from the standpoints of various kinds of information services and different technologies. Libraries constitute a national multibillion dollar resource and must engage in self-evaluation and future planning to serve its many millions of users in the United States. The Wigington study was an excellent effort and has not been given the attention that it deserved.

CONFERENCE BOARD REPORT [1]

The study was sponsored by the Senior Executives Council of the Conference Board. The program was directed by Charles M. Darling III of the Senior Executives Council, who in a sense picked up the challenge thrown at the world by the Japan Computer Usage Development Institute, author of the Japanese White Paper discussed earlier in this book. Acknowledgement of the Japanese White Paper is made in the preface of the Conference Board by Alexander B. Trowbridge, President of the Conference Board, who wrote:

> "Externally, Japan and a number of other countries are beginning to challenge the leadership in information technology which the United States has held during the past 25 or more years. More especially, the Japanese have published a "Computer White Paper" which outlines syndicates to be established, how computers are to be produced, how communications channels are to be managed, and how business, government, and education are to work together. In doing this, it begins the process of developing overarching national policies to manage this powerful resource at home and compete more effectively for markets ahead.Here in the United States, the concept of an information technology industry, much less a national policy, continues to be a highly fragmented one. There is a broadcast industry, a computer industry, and so on. There is relatively little recognition that these are only components in an over-all information technology industry dealing with information as a common product, which requires more carefully thought-out goals and policies, standardized interrelationships, clearer over-all industry configurations and "systems."

[1] Ways, Max, et al, Information Technology: Some Critical Implications for Decision Makers, The Conference Board, New York, N.Y., 1972. pp 240.

Looking at industry and government, Trowbridge writes:

> "The segmented view of the industry may become an impediment to progress. Not only have we lacked a larger appreciation of the industry, but long-range planning has been generally confined to a four- to ten-year time frame, often narrowed to specific product lines rather than to the industry as a whole as well as to its component parts. The Federal government, increasingly mindful of the potential power of information technology for altering values, influencing human rights, modifying institutional objectives, organizations and relationships, and ordering national goals and priorities, is launching a number of investigations into various aspects of this new industry. According to Dr. Bruce Gilchrist of the American Federal of Information Processing Societies in the May 31, 1971 issue of the New York Times" "These efforts are not being coordinated. Any decision based on a narrow perspective may do great over-all damage while being entirely correct from a parochial point of view. An attempt should be made to look at the bigger picture..."

To look at the problem, 42 experts were assembled by the Conference Board. Eight of these served as chairmen, conducting panel sessions and then interpreting the reports of the remaining 34 panelists. Each of the panelists was asked to prepare a paper while engaging in "responsible conjecture" in their assigned fields. The report is much too long to go into it in detail, hence the table of contents is reproduced on the next page to show the subjects covered and the names of the chairmen of each group. The names of some of the other experts include: Robert Solo, Raymond Bauer, Leonard Silk,Michael Duggan, Robert Fano, Michael Levy, Lofti Zadeh, James Barber, Charles DeCarlo, Richard Falk, Martin Trow, Aaron Wildavsky and John Platt.

Max Ways started off with the question: Can Information Technology be Managed? He writes:

> "Advances in the storage, retrieval, processing and distribution of information make up the central technological achievements of the century's third quarter. Within two decades these new information technologies have become an indispensable part if the web that holds society together... The new ways of handling information have brought about fundamental changes in governmental and political processes. They have altered the psychological and cultural attitudes of hundred of millions who have only the haziest notions of how the new technology works. No wonder many thoughtful people believe that the new information technology will prove as important to human development as all the inventions and innovations introudced during the first 150 years of the Industrial Revolution. Looking back, we can all think of the massive horrors that would have been averted or, at least, ameliorated if the Industrial Revolution had been guided more intelligently by the societies that gave it birth and nurture...Neither the 19th century's squalor nor the twentieth century's record of social conflict and environmental pollution had to happen.

Contents

> Will we do better with the computer, the television set, and the other information-handling devices that are already waiting in the wings? The next 20 years will be the critical period when the quality of our response to information technology will be disclosed. So far, none of the societies that have embraced the new information technologies seem to have a satisfactory grip on their implications or any clear sense of how they should or should not be used...(A)s the employment of these technologies continue to spread rapidly, it will be disgraceful if policy questions generated by them are not soon identified, discussed, and dealt with.
>
> Dealt with by whom? Most of the businessmen, engineers, and professional communicators who are intimately involved with the new technology do not think of themselves as "making policy" for the society....Government, like business, has become deeply involved in the new information technology on a piecemeal basis. But within the government there has not been enough effort to develop coherent attitudes and policies that extend beyond the mass bureaucratic needs of this agency or that one. Still less has there been much pertinent political discussion of how government could contribute to the policy-making functions by which the society as a whole will determine its response to information technology."

These are portentous questions that the experts discuss in a variety of ways and permutations, a delight to read and meditate on. Each of the eight chapters has an executive digest that will help those who do not have the time to savor all of the contents. The excellent quality of each of the chapters makes it difficult to choose one over the other for special treatment.

Scholars and scientists will treasure the last section of the report that was prepared by John McHale, Director of the Center for Integrative Studies, State University of New York. His section is entitled, The Changing Information Environment: A Selective Topography, and provides a number of diagrams that have received considerable attention in books, articles and classrooms.

In his preface, Trowbridge states:

> "This report constitutes a valuable input to management thinking. It begins to develop a more strategic and therefore overarching view of information technology and its likely significant implications for business, education, government, and most important, the individual. It sets the stage for the formulation of action programs, but does not propose them. This is the subject of a following report.

We will now repair to this report.

KOZMETSKY (CONFERENCE BOARD) REPORT [1]

This report was prepared by George Kozmetsky, Dean of the Graduate School of Business Administration, and Professor Timothy Ruefli, both of the University of Texas at Austin. The Director of the Project was Charles M. Darling II. The Report was prepared for the Senior Executives Council of the Conference Board as a follow-up to the first Report, Information Technology, Some Critical Implications for Decision Makers. As pointed out in the Preface, it sets forth ten of the more compelling issues that call for policy-level attention in the United States. The recommendations are "strikingly similar in many respects to those put forward by the European-based Organization for Economic Cooperation and Development (OECD) and in Japan by the Japan Computer Usage Development Institute. Summaries of both of these reports are included in the Kozmetsky paper as Appendixes II and III.

The Kozmetky-Ruefli team called on each of the five chairmen who prepared the background papers contained in the main report to identify the issues emerging from the report that they felt needed early leadership attention. Additionally, a group of 13 businessmen, representing some of the corporate chief executives on the Conference Board's Senior Executive Council, most involved directly or peripherally in the field of computers and communications within their companies, were asked to submit their candidate recommendations. From these two sources, Kozmetsky-Ruefli formulated a series of possible initiatives, grouped into three categories - policy questions, the most effective applications and uses of advanced improvements in communications, and the development of information technology as a strategic resource. The authors indicate that the issues selected are the most important in their minds, but there were others not given the priority treatment. Those selected are only the beginning of policy considerations and program formulation; more definition and assessment were needs. Theyall require collaborative (and competitive) actions by leaders in business, education, governments, and the communities of science and technology.

1 Kozmetsky, George and Ruefli, Timothy W., Information Technology: Initiatives for Today - Decisions That Cannot Wait, Some Major Problem Areas and Leadership Options, Part Two of a study on Information Technology - Some Critical Implications for Decision Makers 1971 - 1990, Prepared for The Senior Executives Council of the Conference Board, New York, 1972, pp 50.

In the Introduction to the study, the authors set the stage for their intiatives. They say:

> "A new resource of strategic national and international importance has been developed. We call it information technologies. With the help of these technologies we have alrady mapped the globe and probed the universe. We have collapsed time and space. We have multiplied concepts and attitudes. We have unified nations out of separate provinces and states. We have enabled the shift from an industrial to a predominantly service economy. We have created the means for both strengthening and destroying individual rights and freedoms. We have freed man to participate in broader and more meaningful activities. At the same time, we have confronted him with a new "illiteracy," since his past experiences and education rarely provide an adequate understanding for the use of the newer electronic means of computing and communication. ...Heretofore, we have looked at information in terns of printing, broadcasting, advertising, libraries, computers, and various other ways of transmitting ideas in tangible form. These have emerged as separate trade and professional associations, each with its own distinctive objectives and policies. In some countries these developing aims, more often than not, disregard the challenges and opportunities that involve the public interest as well as the many components of the information industry. It is now a matter of highest priority that we begin to perceive and conceptualize information technologies, industries, and resources in comprehensive, or what might be called strategic, terms. There are several reasons why this is so. The information "industry" in its broadest sense could soon become the leading edge of many economies. These technologies can contribute to the resolution of some of our many complex problems. They can provide us with the capabilities for formulating and ordering our goals and priorities. The Seventies and Eighties may be the period when critical alternatives for the development and direction of information technologies must be formulated and the difficult selection of the desired alternative made if we are to protect the public interest...(T)hese are strategic policy considerations for a society that of necessity must think in both national and international. strategic and tactical terms as a matter of some urgency.

In their first chapter, the authors state that the basic imperative is to take a comprehensive view and understanding of information technology. It must be seen as an "interdependent" industry, as an emergent national resource, whose value as a management tool may be the decisive factor in our efforts to cope with national problems and to maintain out international competitive position, and as a source of economic and political power, requiring policy decisions to ensure that it is used to serve the national interests. Because of the ways that information technology is divided into publishing, telecommunications, computing, information services and the like, information technology is not yet perceived or organized in ways that can enhance the services required of it by the nation. Two initiatives are called for to achieve a comprehensive view and understanding

of information technology."

1. A system of periodic and comprehensive reporting of the developments and application of information technology should be set up in both the public and private sectors to keep abreast of developments in this field.

2. Top management in each company and institution should appoint a small staff to study the specific implications of information technology for its own operations, objectives and policies.

There is a need for an independent center to formulate national information policy. Two initiatives are recommended to be undertaken by business, government, education, and foundations working separately and together.

3. Create an independent, nonpolitical center with th e capability to formulate alternative national policies in the area of information technology.

4. Survey and assess the present activities and regulations relating to information technology in all agencies of the Federal government.

There is a need to better understand the relation to the right of privacy and the public interest in connection with the collection, storage, and use of information for policy makers. Hence:

5. A study into the imoact of current regulations on both privacy and the public interest to determine guidelines and appropriate areas for government controls or private self-regulation should be conducted by an independent research center, sponsored and directed by the Federal government or by a consortium of concerned companies in the communications industry.

The management of a government or business institution must make its more important decisions with some realistic measure of the likely reactions to be expected. Business organizations, education, government, law, order and justice all need periodic updating as they are affected by the growth of information technology. This calls for a study to:

6. Determine the implications and influences of information technology on human aspirations and attitudes, including the cycle of work and leisure and new concepts of profitability and their measurement, through a multi-objective study, funded by a combination of businesses and foundations.

More prompt and deliberate attention must be given to the desirability and development of nationwide information systems to serve all of the sectors. This will be needed for public and private planning. Thus:

7. Survey the status of existing data banks, both public and private, with regard to their locations, usefulness, and efficiency.

8. Establish a committee of owners and users of data banks from business, government, and educational institutions to recommend and activate expanded information networks on the basis of the findings of the above survey.

1.9

Top management should have a working appreciation of the new organizational arrangements, as well as the new management concepts, made possible by information technology. Newer, more flexible, and more individualized management styles are needed. Therefore:

> 9. Sponsor an interdisciplinary study of the implications and uses of information technology in managing increasingly interdependent institutions in business, education, and government,including the auditing of policies, pracitices, and social performance.
>
> 10. Design, develop, and produce new hardware and software tools and systems for specific use by top management.

In the President's "New Technology Opportunity Program" announced by the White House on October 31, 1971, communications ranked second in a list of new technologies which should be more deliberately applied to national needs. More attention needs to be given to the use of new information technology and the"systems approach" for problem-solving, resources allocation,and opportunity development. Thus:

> 11 . Detail the current status of problems of national ceoncern and encourage the use of information technology to coordinate local, regional, and Federal programs and resources for their solution by a comprehensive reporting system, established at the Federal level and drawing on imputs from business and education and existing data banks and research centers.

Without overcentralizing the control of information technology as a potential national resource, research and development efforts in this area should be more systematized, and better coordinated and managed. There should be an initiative to:

> 12. Encourage a higher priority to allocation of funds through appropriate government agencies for research and development and scholarships and awards in the area of information technology in terms of national needs and priorities.

So that communications breakdowns do not deter full utilization of information or permit misuse of information or misdirection of developments, priority efforts should be made to reduce the "literacy gaps" that already exist and have been partly created by the technology itself. The antidote is to:

> 13. Design and introduce into management-development programs in universities, corporations, and government, training courses in the scope and potential of information technology and the skills required to use and manage it.
>
> 14. Accelerate the further development and use of "feedback" opportunities, channels, and systems linking developers, vendors, and consumers of information technology.

Beyond the need to improve management training, there is a requirement to design a comprehensive educational program to serve the need of an information-dependent society. Thus, we should:

> 15. Introduce into our schools and colleges educational programs and instructional methods in information technology to meet the manpower requirements of an information-dependent society and prepare the talent to manage this emerging national resource.

How much attention did the Kozmetsky-Ruefli study receive? After the initial distribution, largely to industry, hardly any. Both of the Conference Board reports, so crammed with valuable insights and recommendations, were shelved, hardly to be mentioned again. The Conference Board undertook the next year a major intercontinental conference in Brussels. The author presented a paper at this meeting.[1] Several other papers were read by speakers from both sides of the Atlantic, but no report similar to the first two was released. In addition, the Conference Board contracted for a multimedia presentation, which told the story of the arrival of information technology and what it presaged. There was a showing of the presentation in Washington, D.C., but at this point the Conference Board decided to drop its information program, largely due to a change of its priorities. It never followed up on its pioneering work, a loss to the country and the growing information community.

[1] Aines, Andrew A., A Report on Today's Leadership Imperatives: Decisions that Cannot Wait, a report to the Information Society of the 70s and 80s - a Transatlantic Assessment Conference, Brussels, Belgium, June 2, 1972. pp 12.

NCLIS NATIONAL PROGRAM REPORT[1]

The decision to prepare the National Programs Report was made by the National Commission on Libraries and Information Science (NCLIS) in mid-June 1973. From the start, it was intended to be prepared in-house by the members and staff of the Commission as a framework on which the library and information science professionals would be able to construct a national program. As the library and information services fields felt the impact of the information technology revolution and the so-called "information explosion" on their programs and services during the early 1970s, there was a growing feeling that these communities had to "roll up their sleeves" and prepare early blueprints for national programs. There was also recognition that the borders between the two sectors were being erased by technological and other developments, just as the demarcations between the field of computers and the field of communications were disappearing. The impetus for the preparation of a national programs report also came from hundreds of letters, testimony given at many regional hearings by NCLIS, and encouragement given to the Commission for such an effort in many seminars and open forums. Another reason for the effort was the need on the part of the Commission to determine how it would discharge its responsibilities under the law which brought it into being in 1970. The length of time it took the Commission to complete the Report was largely due to the extraordinary amount of interaction with individuals and organizations involved in library and information science endeavors. Quite rightfully, it recognized for its blueprint to be accepted, it was necessary to work with the communities involved. The preparation of a "bold and non-traditional document" that would be an out-and-out threat to ongoing library and information services was discarded as a viable approach. The more common sense approach was to build the national programs on the current services, rather than calling for a new and expensive

[1] Becker, Joseph et al, Toward a National Program for Library and Information Services: Goals for Action, National Commission on Libraries and Information Science, Washington, D.C., May 1975, pp 106.

information services ediface that would supplant the conventional library and information organizations in the public and the private sectors.

Perhaps the most difficult task the Commission faced was to select a number of assumptions that would provide a bedrock for its ultimate recommendations. As a Member of NCLIS during this period, the author can remember the agonizing that took place in 1973 to select five major assumptions that the total community would accept. In summary these were:

> 1. The total library and information resource in the United States is a national resource. This resource needed to be developed, strengthened, organized and made maximally available in the public interest.
>
> 2. All people of the United States have the right, according to their individual needs, to realistic and convenient access to this national resource.
>
> 3. With the help of new technology and national resolve, the disparate and discrete collections of recorded information in the United States can become, in due course, an integrated nationwide network
>
> 4. Rights and interests of authors, publishers and other providers of information should be recognized in ways to maintain there economic and competitive viability.
>
> 5. Proposed legislation will not undermine constitutionally-protected rights of personal privacy and intellectual freedom, and will preserve local, state and regional government.

The short range goal selected by the Commission was:

> To develop a plan for a flexible network of information services to meet the immediate and foreseeable information requirements of the greatest number of people.

The longer range goal was:

> To eventually provide every individual in the United States with equal opportunity of access to that part of the total information resource which will satisfy the individual's educational, working, cultural and leisure-time needs and interests, regardless of the individual's location, social or physical condition or level of intellectual achievement.

It was not easy to get consensus for such a broad, almost impossible to achieve, goal, recognizing that this was an "Information Magna Carta" in effect that flew in the face of reality. How other Members of the Commission rationalized their votes for such a transcendental ideal is not recorded, but this Member decided that practical or not

it was compatible with the notion of a democracy in the Information Age, i.e., political democracy had a better chance to flourish when all citizens had access to knowledge, rather than an elite, which had the affluence and the sophistication needed to obtain access. In the society of the future, deprivation of knowledge might be akin to the deprivation of food, water and air to breathe. Oddly, although some of the readers of the report thought that the Commission as unworldly in including this goal, there was no hullabaloo, no press comment. To make progress to attain this goal, the Commission developed two program objectives:

> 1. To strengthen, develop, or create where needed, human and material resources which are supportive of high quality library and information services; and
>
> 2. To join together the library and information facilities of the country, through a common pattern of organization, uniform standards, and shared communications, to form a nationwide network.

Maximum cooperation and participation would be needed from states,local governments, and by interested public and private organizations, as well. The Federal governemt would have responsibility for aiding in the development of compatible state and multi-state networks, furthering common practices, performing relevant research and development, increasing coordination between the public and private sectors, improving access to the information resources of the Federal agencies, and performing other relevant functions. The Federal government would neither directly control nor operate the nationwide network, nor have control over information content in the network.

The nationwide network proposed by the Commission would not be a monolithic and authoritarian superstructure, but would form a shelter and framework for families of geographic and functional networks developed and interconnected according to a comprehensive plan. The Commission pointed out that the concept of a nationwide network did not imply "the absurd notion" that only once copy of a particular book or publication would be sufficient for the entire country to use. This was a concern of publishers that was put to rest with the observation that "an ideal nationwide network requires provision of local holdings of sufficient scope and quantity to satisfy the immediate needs of

local users. The information network would provide the additional back-up resources as well as the communication directions for reaching specialized materials and information in other libraries and information centers when these are needed badly.

The Report is too lengthy to go into detail, It contains six chapters, references, notes, glossary, listing of related papers,three appendices, three figures, and an index. The first chapter - The Need for a National Program for Library and Information Services - discusses resources, need for access, challenges, influence of technology, copyright, and rationale for Federal involvement. The second chapter - Current Problems of Libraries - discusses public, special, school, university, research, academic, state, Federal libraries and their common and distinctive problems. The third chapter - Some Concerns of the Private Sector - looks at economic viability, relationship to the Federal government, and property rights. The fourth chapter - The Trend Toward Cooperative Action - addresses current networking activities and barriers to cooperative action. The fifth chapter - The Recoomended National Program - provides eight program objectives, already covered earlier in this section, major Federal responsibilities: to encourage and promulgate standards, make unique and major resource collections available nationwide, develop centralized services for networking, explore computer use, apply new forms of telecommunications, support research and development, and to foster cooperation with similar national and international programs. The chapter also covers: responsibilities and organizational relationships of State governments, the private sector, the Library of Congress, proposed legislation, and funding. Chapter VI - the Conclusion - summarizes some of the highpoints of the Report: the country's libraries and information services are not yet organized to meet the nation's needs as a whole; while they serve their client groups, they are developing haphazardly; information and knowledge must be treated as a national resource and made available for all people; such a program will be an intellectual catalyst for the country and an aid to solve economic and social problems; careful planning is needed in consideration of deficiencies in current resources and services, so is education and training; improved funding is needed for libraries and information services; new technologies should be

applied in a cost-effective way; a spirit of cooperation needs to be developed to achieve a countrywide approach; new Federal policies are needed to treat information as a national resource; unprecedented investment will be needed by Federal, state and local governments; and the American people are urged to support a nationwide program of library and information service as a high-priority national goal through Federal, state, and local governments, as well as public and private institutions.

Special tribute should be given to Joseph Becker for his hard work in preparing the final document and for his patience in making multiple changes as the contents were modified and re-modified. The good will that was needed to accomplish some of the goals of the report did not pour forth as hoped. The public and the private information sectors did not reach amicable accord as a result of the pleas of NCLIS that they do so in the public interest. The library and the information service sectors did not beat their swords into plowshares as a result of the Report. Legislation did not result to achieve the expressed goals of the Commission. Congress and the Executive Office of the President did not show any happiness or unhappingess with the NCLIS' findings.There was no outpouring of gratitude from the public for NCLIS' insistence that its access to information was a high priority. Like so many other reports in the genre, there was a momentary blip on the oscillograph of history. Perhaps, the biggest gains went to the members and staff of NCLIS. Forged on the anvil of the effort came a better understanding of the needs, the challenges, and limits in the development of a national library and unformation program. As a learning exercise, the preparation of "Toward a National Program for Library and Information Services: Goals for Action" was nonpareil, not only for the Commission, but for the library and information community and government officials at all levels.

SCATT REPORT [1]

As written earlier in this book, a group of professors got together in the summer of 1970 and came up with a report they called "UNISTAR - A User Network for Information Storage, Transfer, Acquisition, and Retrieval. Not to be outdone by this team from Auburn University,for the most part, is another team from the Busch Center of the Wharton School of Business, The first group, made up largely of engineers, marched under the flag of "systems engineering." The second group, whose general was Russell L. Ackoff, marched under the banner of the "idealized design planning." The Ackoff "Army" was modest in size, consisting of Thomas A. Cowan, Wladimir M. Sachs, Marybeth L. Meditz, Peter Davis, James Emery, Martin C.J. Elton. It was not a sombre army as revealed in the last sentence of the Prologue:

> We hope that the reader will have as much fun in reading this report as we have had in producing it. May he have reward enough to justify his effort and ours.

Lee G. Burchinal, National Science Foundation, the sponsor of the study, writes in his Foreword:

> Dr. Ackoff has pioneered in studies aimed at developing ideal systems for a number of problems. Now with NSF support, Ackoff and his research team have begun developing an ideal system for the scientific and technical enterprise in the United States. This development requires successive revision of a conceptual framework for organizing the flow of information from points of origin to all possible points of application. One of the beauties of this approach is that all affected parties... can help shape the evolving model...The ideal system for scientific and technical information, as seen by Ackoff and associates, is not the system to be implemented, but instead is a first approximation of what might be possible within our decentralized, pluralistic scientific and technical community. Implementation of any elements of the proposed ideal system rests upon voluntary cooperative arrangements among the affected parties...For the first time, we have an explicit alternative to our usual pattern of incremental drift in the evolution of national capabilities of transferring information...Achoff offers the information and technology transfer communities and the persons they serve an opportunity to join in a national town meeting to debate and help shape the framework for services in the coming decades...Send comments directly to Dr. Achoff.

In the Prologue, the authors modestly state:

[1] Ackoff, Russell L. et al, Designing a National Scientific and Technological Communication System (The Scatt Report), University of Pennsylvania Press, Philadelphia, Pa, 1976, 173 pages. (Developed with the support of the National Science Foundation's Office of Science Information Service)

> The primary purpose of the project reported here is not what it appears to be: to produce a design of a National Scientific Communication and Technology Transfer (SCATT) System that would in some sense be preferable to the one currently available. Rather, its purpose is to mobilize the large number of relatively autonomous subsystems of the current system into a collaborative effort directed at redesigning their system and implementing their design. The idealized design process used is intended to stimulate such a mobilization, and the design produced is intended to serve as a platform from which that mobilization can spring...(T)he idealized design process has no end point. Therefore, this report was prepared at an arbitrary point in time..(It) is the product of the sixth iteration of the design process.

Because the concept of idealization is key to the study, some explanation of the process as seen by the authors is necessary. The design process is subject to two constraints. First the design may not involve any technology that is not now known to be feasible, and second, the system designed must be operationally viable. It must be capable of operating if it did come into existence. The product of an idealized design is not a design of an ideal system, rather it is an ideal-seeking system,... it is not utopian since the concept of the ideal will change with time. Its advantage is that it converts planning from a retrospective to a prospective orientation. It invites and facilitates the par ticipation of all stakeholders in the system, and tends to generate consensus among those who otherwise would disagree on what should be done in a program. Moreover, it encourages looking at a whole system, rather than focusing on one or more parts to the exclusion of others. It induces more creativity in design than would otherwide occur and enlarges the designers' concept of what is feasible.

The authors came up with a list of assumptions and values that would in their view facilitate understanding and appreciation of the SCATT design Some of these are summarized as follows:

> There is a societal need for better results from science and technology, a need serviced by increased efficiency of science communications and technological transfer , which will in turn reduce unproduc tive duplications of effort and lead to creativity and innovation.

> Effective and efficient production and use of science and technology can be facilitated by communication within and between the scientific and technical communities and the larger communities that contain them.
>
> The communication systems must be oriented primarily toward its users, while serving effectively other participants and stakeholders in the system; moreover the system should be flexible and adaptive to all changes that take place.
>
> Responsivity of the system can be improved by enabling the participation of all stakeholders, by requiring the system to support itself through service charges, and permitting competitive services to exist.
>
> Time of working scientists and technologists is precious; hence the amount of it required to produce, distribute, gain access to, and use information should be minimized. The implies the reduction of irrelevant, redundant, and useless information they receive. The System should not make the choices for the users, only provide freedom of choice of users.
>
> The SCATT system should be easy to use by a variety of self-determined users. Availability should be maximized; this includes informal as well as formal communication, even for so-called "invisible colleges." Privacy of all users should be respected.

The authors point out that there is nothing basically "national" about their formula; the System should permit flexible interchange with other national systems in an international network; arts, humanities, business, government and related fields other than science and technology included. The System would be divided into a number of components: a National SCATT Center, regional centers, local centers, Congress (reference is to the Library of Congress), using organizations and individuals, and affilitated organizations and institutions. Each nation would have a cooperating SCATT center that would interact with other national centers. Although the system would be self-supporting, its initiation should be authorized and funded by Congress. Libraries would continue to play a major role in disseminating information to their users, but they would be part of the SCATT system. Being an idealized system the study group conveniently put aside the question of funding, what the system would cost to start up and operate. How the SCATT system would interact with the present science and technology information system and sub-systems is also left out of the picture, leaving the reader to conjure up his or her own conjectures as to how this would be done. The report contains no mention of other national and Federal scientific and technical information plans described in this book. Had the authors provided

some of the missing information - funding data, integration with current scientific and technical information systems and subsystems, and similarities and dissimilarities with other scientific and technical information reports (Baker, Weinberg, SATCOM, et al) - one suspects that the authors would not have had the fun they admitted having in the Prologue. But the SCATT Report should be praised in pointing out that there are basic requirements in designing a national scientific and technical information system: it should include all stakeholders; it should be user oriented; it should focus on the total system rather than pieces of it; it should seek to reduce the information-handling time of scientists and engineers; and developers and managers of information systems should recognize that the primary mission is to improve the productivity and innovation of the sciences and technologies being supported. There is no indication that the SCATT Report received any more approval and implementation than some of the other reports covered in this document. Since it was distributed solely by the University of Pennsylvania Press, the chances are that it received less attention than merited.

WHALEN REPORT [1]

The basic reason why the National Science Foundation contracted to prepare Scientific and Technical Information: Options for National Action by the Mitre Corporation had to do with the recent establishment of the Office of Science and Technology Policy (OSTP) in the Executive Office of the President. Public Law 94-282, the National Science and Technology Policy, Organization and Priorities Act of 1976 not only returned the science function to the White House, it also established a broad Federal policy dealing with scientific and technical information, namely:

> It is the responsibility of the Federal Government to promote prompt effective. reliable, and systematic transfer of science and technology information by such appropriate methods as programs conducted by non-governmental organizations, including industrial groups and technical societies...to coordinate and unify its own science and technology information systems...(and) to facilitate the close couplings of institutional scientific research with commercial application of the useful findings of science.

[1] Whalen, Bruce G (Principal Investigator) and Joyce, Charles C., Scientific and Technical Information: Options for National Action, Prepared for the National Science Foundation by the Mitre Corporation, McLean, Va. November 1976, 68 p.

Whalen and Joyce point out that the law did not establish mechanisms to deal with scientific and technical information concerns; instead a President's Committee on Science and Technology was to be established to conduct a comprehensive, two year survey of all aspects of Federal R&D, including scientific and technical information. It was to identify major scientific and technical information issues and action alternatives for the Office of Science and Technology Policy (OSTP) that the MITRE Corporation was asked to undertake an analysis of the STI aspects of P.L. 94-282. MITRE used past reviews and studies as the basis for its analysis. From these reviews and studies came three common precepts: scientific and technical information is an integral part of R&D and the primary means by which research results are translated into useful applications for the well-being of the nation. Scientific and technical information is "big business," encompassing both the governmental and private sectors and representing billions of dollars in annual expenditures. The area is growing at a rapid rate commensurate with the growth of the "Information Industry" in general. The growth of scientific and technical information and its systems has not been guided by coordinated policies, thus resulting in efficiencies, potential duplication and waste, and causing both organizational and managerial problems. Also the ability of the scientific and technical information systems to serve the needs of users has been questioned. The investigators found that the underlying rationale for conducting these major scientific and technical information studies and reviews (most of these are covered in this section) is that little is being done by the Federal Government to deal with scientific and technical issues although the government, as the largest sponsor of R&D, should bear the responsibility for assuring an effective national system for scientific and technical communication.

The authors write:

> Given the broad policy mandates delineated in P.L. 94-282, and recognizing that the survey will not be completed for at least two years, the OSTP is then faced with the fundamental decision whether to initiate action in the scientific and technical information area now, or wait until the survey effort has been completed. What can OSTP do to begin to address the complexity of issues surrounding scientific and technical information? Based on MITRE's review of past efforts two categories of action are suggested:

1. New organizational mechanisms to deal with Federal as well as national STI concerns could be established, including

- A focal point to assume responsibility for agency-wide direction and control of STI activities within each Federal agency engaged in R&D.

- A Federal Agency Coordinating Group, composed of agency focal point representatives and other concerned Federal organizations, to serve as a focal point for coordination and management of Federal STI activities. This group would support FCCSET in matters pertaining to STI.

- An Information Policy Board, composed of representatives from the major Federal agencies involved in government-wide policy research and policy development relating to STI...to develop and recommend STI policies for approval by the President and subsequent adoption by all concerned Federal agencies. The Board would be supported by one or more advisory committees representing major "stakeholders" in the nation's STI enterprise, i.e., the private sector, state/local governments, professional groups and the like. The advisory committees would support the Board in its policy formulation role and serve as a bridge between the government and the private sector.

2. The need for further study of the STI area has been repeatedly expressed. Past major studies tend to express needs for action based on informed opinion and do not, on the whole, offer statistical or anecdotal evidence... Therefore, the OSTP could initiate a series of activities designed to obtain more concrete data on the nation's STI enterprise and more contemporary information on key STI issues. Areas for consideration include:

- Compiling a body of data on the structure and economic parts of the nation's STI enterprise for use by the OSTP and other concerned organizations;

- Reviewing current Federal STI policies and developing recommendations for formulation of improved policies;

- Investigating the desirability of further centralization of Federal STI activities;

- Assessing the issues related to standards and/or the compatability of Federal STI systems; and

- Evaluating the current effectiveness of the major Federal STI systems.

The authors go on to point out that the implementation of the new organizational mechanisms would assist OSTP in dealing with national and Federal STI issues by providing a framework through which STI policies could be developed and improved coordination and cooperation of STI studies could be achieved...These proposed action options are by no means all-inclusive; however, they do reflect the consensus of a number of eminent STI study reports and provide a basis for addressing problems associated with scientific and technical communication.

NATIONAL INFORMATION POLICY REPORT [1]

The genesis of this landmark report began in September 1975 in Washington, D.C. when a Roundtable on Privacy and Information Policy was convened by the Vice-President of the United States to examine information issues and discuss the need for a national information policy. A group of experts was assembled to discuss a wide-ranging set of current and future information problems. A second formal gathering was held in July 1976 in conjunction with the Domestic Council Committee on the Right of Privacy to discuss national information policy issues. Some 40 experts from the public and the private sector convened to categorize and analyze the critical information issues. In March 1976, the President sent a memorandum to the Vice President asking him to:

- o review and clearly define the information policy issues which confront Federal policymakers,
- o ascertain the status of information policy studies now going forward within a number of agencies in the Executive Branch, and
- o report to him by September 1, 1976, with recommendations on how the Federal government should organize itself to deal with these information issues.

Not shown in the Foreword of the Report is another event that had much to do with the Privacy Committee undertaking the project. This was a conference organized by Professor W. Theodore Durr of the University of Baltimore on the subject of the information revolution. This author was a speaker at the Conference and his subject dealt with the difficulty of formulating information policy in the Federal government. Quincy Rodgers attended the University of Baltimore Conference and discussed the possibility of his Committee, which had just completed its formal report dealing with the protection of privacy, looking into the subject prior to its being disbanded. The thought was applauded as being timely and appropriate. It was following these discussions that the Roundtable on Privacy andInformation Policy was convened by the Vice-President at the urging of Quincy Rodgers. Quincy Rodgers borrowed Andrew A. Aines from the National Science Foundation to act as his advisor. Joseph Becker,

[1] Rockefeller, Nelson A., Rodgers, Quincy, et al, National Information Policy, Report to the President of the United States, Domestic Council Committee on the Right of Privacy, Honorable Nelson A. Rockefeller, Chairman, transmitted to the President on September 1, 1976. Printed by the National Commission on Libraries and Information Science and released on July 19, 1976

President of Becker and Hayes,Inc. and a member of the National Commission on Libraries and Information Science, whose expertise and writing skills are second to none, was invited to participate, along with a well known expert in international computing and information matters, G. Russell Pipe, an American citizen who resides in Amsterdam, Holland. Rodgers also held discussions with other individuals and groups prior and during the preparation of the report.

Although the report focuses on the need for national information policy and the responsibility of the Federal government to provide energy, resources and leadership in the quest for such policy, right from the start the Committee and its supporting players recognized that a single national information policy in a changing society was impossible. What was within our power to create is a set of sub-or mini-policies covering specific areas in various information fields that could be upgraded with the passage of time. Unfortunately, this understanding was not shared with some critics who rejected out of hand the notion of a national information policy without bothering to understand what the Domestic Council had in mind. There were other critics who believed that the formulation of information policies of any kind was antithetic to the freedom they had in doing what they wished. Individuals with this attitude were largely in the private sector, but a few were encountered in the Federal government. To them, the dynamics, the freedom, of the marketplace was much more attractive than cooperative efforts that would reduce degrees of freedom they enjoyed.

It is difficult to compress 230 pages into a few paragraphs; fortunately, the report contains an executive summary that provides the gist of the report in four pages, but the reader would make a mistake if he or she confined his or her reading to the executive summary. There is considerably more substance that the reader would get if the entire publication is read.

The first chapter contains a statement of the problem. It covers the impact of new information technology, the arrival of the "information age," the role of the government in shaping information policy, and how the legislative and executive branches have responded to these problems up to the time of the writing of the report.

1.9

The substance of the report is contained in the second chapter which is dedicated to major information policy issues. It is a long chapter over 150 pages in length, divided into five issue clusters, including: government information, collection, transfer and dissemination; information in commerce: A resource for public good and private gain; the interaction between technology and government; international implications of information policies and developments; and preparing for the information age. The five clusters cover 15 information issues, each stated in the form of a recommendation. For example, Issue 1 states: "Formulate collection policies to balance governmental needs against economic, political and social costs. Issue 15 states: "Evaluate the political, social and economic implications of information networks and information utilities."

Chapter 3 provides a number of recommendations to the President as follows:

> 1. The United States set as a goal the development of a coordinated National Information Policy.
>
> 2. There be established in the Executive Office of the President an Office of Information Policy by either restructuring and expanding responsibilities within any of several existing entitites.
>
> 3. An inter-agency Council on Information Policy should be created, consisting of high-level agency representatives, chaired by the Director of the Office of Information Policy.
>
> 4. An Advisory Committee .... be created to assist the Office of Information Policy in the performance of its duties, and this committee be representative of the private sector, local government, and the academic and professional disciplines concerned with the information policy issues discussed in the report.

The report stressed the need for a unified approach to allow coordinated policymaking to take shape. Bringing together the threads of a national information policy in one location meets several needs:

> Information policy issues are interrelated so that actions taken in one area may impact others. Decisions directed at one specific problem may have consequences for other problems. Thus the rules for dissemination of government-held information (Issue 3) affect the private information industry (Issue 5). Changes in laws affecting copyright (Issue 4) and postal rates (Issue 8), publication of government documents (Issue 5), and legislation such as the Right of Privacy Act (Issues 2 and 6) and the Freedom of Information Act (Issue 3), all affect the usefullness and accessibility of information, though these changes may have been initially prompted by discrete considerations. As Pro-

> fessor Oettinger said in speaking of information policy, "Everything is related to everything else." [1] At present no unit of government has the authority to respond to that reality. Comprehensive attention to information policy issues provides the most efficient use of manpower and skills. A unified approach to these issues will permit the development of strong and systained policy skills, take maximum advantage of related experiences, minimize duplication, and enhance the processes of coordination and policy development... An organizational structure which has high visibility and adequate authority could prevent information concerns from being compromised and traded away for other concerns at the agency level (below the range of public visibility), which has often been the case in the past.

The Committee considered the model of the Department of Transportation as an argument to set up a Department of Information or Communication, but rejected the approach as being premature; policy analysis and groundwork needed to consider or set up such a Department has not yet been accomplished. But it was concluded that the initial need was a group to operate in the Office of the President, so that his authority would not be diluted, and to ensure that under his leadership the individual agencies would play a cooperative role. The Committee also decided that the time was not ripe for any effort that would call for considerable outlay of funds and assignment of personnel. What was needed was the formation of a small group of knowledgeable and dedicated experts to prepare a blueprint of "next steps." The task group recognized the political unpopularity of the Office of Telecommunications Policy at that time and the need to establish a new entity that could operate free of criticism for past mistakes and misjudgements. The report was singularly free from bombast and strong pronouncements.

Not long after the report was put into President Ford's hands, it became apparent that he would not succeed himself as President. As has happened before and will happen again, the report was set aside in the last moments of the Administration. Perhaps the only group that paid any attention to it was the Office of Management and Budget. Through the good office of the National Commission on Libraries and Information Science, the report was printed and disseminated in thousands of copies. It received the attention of the technical press, especially the part committeed to computing, data processing and information matters. For the most part, the comments

[1] Oettinger, Anthony, Keynote Address, Annual Meeting of the American Society for Information Science, Boston, Mass., October 1975

favored the findings and conclusions of the report on National Information Policy. It was discussed in symposiums and conferences of a number of societies and professional groups. Editorialists seemed to be in agreement that action to "start" preparing national information policy was warranted. Some attention was paid to the report in Congress, the Office of Technology Assessment, in particular, but it received hardly any notice among those groups working on telecommunications and information policy. The lack of support from the incoming Administration obviously was the kiss of death to a proposal that deserved better. The continuing lack of interest on the part of the current Administration indicates that the problem and solution that are so carefully studied in the Domestic Council report lack the kind of priority that would initiate action to improve information policymaking today. The inaction implies that the forces that see the value of national information policy formulation are weaker than those who prefer a laissez-faire approach, but there are some indicators that argue for the establishment of policy. Examples are:

1. The great difficulty the Congress has had in updating the Communications Act of 1934, despite years of trying.

2. The intense turmoil resulting from the breaking-up of the American Telephone and Telegraph Co. together with the recognition that the divestation is going to be very costly to consumers.

3. The breakdown in Executive Office of the President stewardship of Federal and national scientific and technical information programs.

4. The erosion of leadership that the U.S. has enjoyed in information and communication matters on the world stage.

5. The lack of a responsible entity in the Executive Branch, including the Executive Office of the President, to respond with wisdom to the demands of the Information Age.

6. Instead of teamwork and cooperation between the public and the private sectors, there is conflict and friction that will inevitably add to the cost and inefficiency of communications, information processing, and information delivery.

7. Failure to seize on the information area as fertile field to explore ways of achieving innovation and productivity in research and development, education and governance.

BECKER REPORT [1]

As pointed out in its Preface, the Becker Report is one of several initiatives undertaken by its author. In a separate document are eight internal working papers that provide background information in support of the Report's conclusions. Also prepared was an experimental color film, "Science Information and Science Policy", an offshoot of the investigation. It captures participants in a day-long conference on science information held at the University of California (Los Angeles), using a new technique of group discussion called "Generative Graphics." The film received the Outstanding Movie of the Year award from the American Society for Information Science.

The Becker Report seeks to describe the Federal government's responsibilities for the dissemination of scientific and technical information (STI). He points out in his Introduction:

> Many different individuals and institutions in the public and the private sectors generate, access, and use science information. But, although science information is everyone's concern, it is presently no one's responsibility. In the U.S. there is no "system" of scientific and technical information. Instead, our pluralistic society has fostered a diverse collection of science information activities composed of loosely coupled units in the public and the private sector.
>
> The study develops a rationale and sets forth a framework for a national program of STI compatible with the perceived new directions of science and our free interprise system. It deals with both information science and science information.
>
> The STI community in the U.S. has four main components: the discipline-oriented systems of the professional societies...; the mission-oriented information systems of the Federal agencies...; the specialized information activities of private institutions and of industry, such as special libraries, information analysis centers, indexing and and abstracting companies, data base services, etc.; and the information files and other resources that are maintained by our institutions of higher learning.

Becker points out that the so-called knowledge explosion assures an increased supply of STI, that there has been an exponential expansion of STI, STI-producing professions and industries, R&D activities, information services and machines, spectacular

[1] Becker, Joseph, A National Approach to Scientific and Technical Information in the United States, Prepared for the National Science Foundation under NSF contract C 963, Los Angeles, California, July 4, 1976, pp 62 + spreadsheet.

spread of electronic computers, and a greater ease of access of STI generally. He sees the accumulation of scientific knowledge and the continuous integration of this knowledge into the mainstream of national life that provides the principal force for national progress. Congress and others, he points out, recognize that the efficient management of our nation's scientific knowledge resources by the scientific communication enterprise is related in a vital way to the quality of our science and engineering work in the U.S., to the ability of our national economy to exploit new knowledge arising from science, to the competitive posture of the U.S. and to the maintenance of our national security. He says that if one accepts this premise, then there is a concomitant obligation to husband and protect the science communication enterprise, and the scientific knowledge that it posssses, as one would any important national resource. He writes:

> It would be easy to allow the scientific communication enterprise to develop haphazardly, but if we really believe that the accumulation and application of scientific knowledge is the handmaiden of progress, then we must begin now to treat STI as a national resource and to make a special effort to achieve additional convergence among related programs. A national program would bring about such convergence not so much by Federal regulation as by a judicious application of research funds towards the development of standards, uniform practices, and informal coordination of the STI community to serve the public interest.

Becker saw considerable hope for the future when he wrote:

> On May 11, 1976, the President signed into law P.L. 94-282, the National Science and Technology Policy, Organization and Priorities Act of 1976. This new law reaffirms government policy with respect to the scientific communication enterprise by stating that "It is the responsibility of the Federal Government to promote prompt, effective, reliable transfer of science and technology information by appropriate methods... "and by recognizing the Federal Government's responsibility "...not only to coordinate and unify its own science and technology information systems, but to facilitate the close coupling of institutional scientific research with the commercial application of the useful findings of science."

That the Office of Science and Technology Policy chose to ignore this part of the law that returned science and scientists to the White House must be a great disappointment to Becker and and the thousands of people and organizations that make up the science communications community in the United States. More about this failure and its repercussions is covered elsewhere in this book.

Students and scholars interested in a short history of the STI field will be interested in reading Becker's second chapter, entitled "An Historical Perspective." In its nine pages he traces events in the science communications and related fields from the early 1950s to the mid-1970s. Reporting on a number of studies - these make up the substance of this chapter - he writes:

> They agreed that we must at least ensure that science information mechanisms are in place that can effectively stimulate and extend individual creativity; and that all science information activities, whether in government or in the private sector, somehow be made to function together in the national interest. While each of the reports had an impact on the science information community, their concordant recommendations did not result in major organizational changes within the science communications enterprise or the Federal government..."

In the third chapter, Becker explores "The New Directions of Science." He saw no possibility that a satisfactory national STI program could evolve without reference to the new directions he writes about in this section of his report. He identifies three new directions that pose challenges to the STI system: the intense dedication of science to the alleviation of national social and environmental problems; the continuing trend towards multidisciplinary science; and the development of "real-time" information systems. He foresaw the coming of national and global monitoring systems that gather staggering quantities of data for analysis, interpretation, and retrieval. These realities would require new approaches to science information wholly different from classical systems used to process publications in the past.

The fourth chapter of the Report, entitled "Pressures on the Scientific Communications Enterprise" further discusses some of the findings and observations written in the previous chapters, but it is the fifth chapter, "Organizing for National Development" that seeks to answer the perennial question:"Yes, I perceive the problem that you describe, but what should we do about it." In this part of his report, Becker makes his recommendations. First, he sees the need for a permanent unit in the Federal structure responsible for examining STI policy issues as they arise and for making informed judgements on how to resolve them. The focal point should be in the office of the Science Advisor to the President. A Panel on Science Information Policy Issues

would be responsible for examining science information policy issues affecting the public and private sectors. With the existence of such a group, it would be possible. to treat STI as a national resource and attend to its long range development. The Panel would not be an operator, but would assess the health of the scientific communication enterprise, formulate recommended polcies to the Science Advisor, consider bilateral and international STI negotiations, and bring the public and the private sectors together. It would articulate national goals, se priorities, establish funding levels for government-sponsored STI R&D, provide a forum, encourage major experiments, and assist the federal agencies in coordination and resolution of conflicting policies. The second major recommendation called for a reorientation of the NSF's R&D program to improve its support of science information programs. It was his belief that NSF should view its Division of Science Information in the broader context of developing and improving the infrastructure for a national scientific information program so that it could gear its research and support program to national goals reflecting the new directions of science. Considerably more effort should be given to the solution of societal problems and the role that STI should play, also the improvement of multidisciplinary science information programs. In this connection, he reviewed a list of 17 objectives culled from the Weinberg, SATCOM, Greenberger, and Conference Board Reports. He suggested that five of the original 17 should be given priority in the following order: foster the development of networking among STI services; encourage use of on-line, interactive STI systems; improve national coordination among STI services; encourage the abstracting and indexing of new STI; and facilitate college-level awareness of STI services.

After reviewing the statutory responsibilities of NSF in the STI area, Becker suggested that Title IX of the National Defense Education Act of 1958 be amended to establish a Division of Science Information Research and Development in lieu of the Science Information Service called for in the Act. He suggested two new explicit responsibilities in the new amendment: the promotion of the sharing, exchange and ut ilization of STI, also the institution of a fundamental and applied research program in support

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of national objectives. He recommended the creation of an Institute under OSTP auspices with which STI elements in the public and private sectors could voluntarily affiliate. The Institute would give members of the STI community and the professional societies a continuing voice in shaping NSF research, as well as a forum for planning and discussing STI programs from a national perspective. The Institute would replace the defunct Science Information Council which was terminated during a government-wide campaign to reduce the number of boards and commissions advising the Federal agencies. It was pointed out that there was ample precedent for the Federal government to establish a non-profit Institute. Interestingly, the idea of an Institute reappeared in legislation recommended by the House Science and Technology Committee a few years later.

The Becker Report is unique in some ways. First, it was prepared by one person, rather than a panel or a committee. Second, the author certainly is one of the most knowledgeable persons in the country, perhaps the world, in matters pertaining to science communications. Third, although it came forward with new recommended actions, what was called for was well within the range of do-able actions. Fourth, the Report was oriented towards the progress of science and technology, rather than the aggrandizement of science communications only. Five, throughout the document is a continuous thread - the need to find a better way to bring the public and private information sectors together as rapidly as possible to achieve the common good.

Like so many of the other studies and reports turned out earlier, the Becker Report made a quiet appearance, received some initial attention from the science communication community, and then suffered the fate of being placed on the shelf. The problem, of course, was the lack of sensitivity of the NSF authorities and the leaders of the Office of Science and Technology Policy. But they were not along. The insensitivity also applied to the leaders of science and technology in and out of the government. Becker anticipated this response with his words: "Science information is everyone's concern, but no one's responsibility." The attitude must be changed or the U.S. will be doomed to a second class STI system.

THE NORA-MINC REPORT ON THE COMPUTERIZATION OF SOCIETY [1]

In his cover letter to the French President, Nora wrote:

> Any thought that is given to data processing and society reinforces the conviction that the balance of modern civilization depends on a mixture difficult to achieve, i.e., the proportioning between an increasingly vigorous exercise of the absolute powers of the State (even if more strictly confined), and the growing exuberance on the part of modern society. Whatever happens, data processing will be one of the major ingredients of this mixture....Approval of our conclusions would require two ways of implementing them, i.e., permanent agencies would have to be established rapidly to apply the policy determined by the Government, and the problems which this report does not cover would have to be examined empirically by competent groups. We suggest that both of these methods be employed simultaneously.

A short summary of the Nora-Minc Report is provided because of the scope of the study and the world-wide attention that it drew. In a sense, it is related to the Japanese White Paper, with the exception that it was prepared by government officials rather than a private sector group. A review of the Table of Contents reveals the scope and the probable biases of the Report and its authors. The Introduction is called "Computerization: a Key Issue in the French Crisis." This is followed by an assemblage of "The Facts:From Computerization to Telematics," which includes a review of the Computer Boom, the Alteration in Telecommunications, and the "Telematic" Future: universal satellites. The Facts are followed by Part One: "The Challenges." There are three Chapters under PartOne: Telematics and New Growth, Telematics and New Power Games, and Telematics and National Independence. Part Two (Points of Support) contains three chapters: The Telecommunications Role, The State and other Actors in the Data Processing Game, and Data Processing for the Administration. Part Three is devoted to "Questions for the Future", and covers two hypotheses: Is a Society Adapting Data Processing a Society of Cultural Conflicts and Planning for an Uncertain Future; Socializing Information. The balance of the report is made up of annexes and supporting documents.

1 Nora, Simon and Minc, Alain, Report on the Computerization of Society, French Board of Financial Examiners, The study was assigned to Nora by the President of the Republic, Valery Giscard d'Estaing, by a letter dated December 20, 1976. The Report was completed in late 1977 and translated by Transemantics, Inc., Washington, D.C.. 137 pages.

The French paper focuses mainly on what it calls "telematics," which is virtually synonymous with what Anthony Oettinger refers to as "compunications," the marriage of telecommunications and computers. The stress, Nora points out, is on telecommunications rather than computers. Interestingly, the Report relegates information to a lesser position, largely because of its intense interest in the machinery of transmission and delivery. This does not necessarily square with the views of Pierre Aigran, who helped write the OECD Report, Information for a Changing Society, reported on elsewhere in this book. Nor does it take into account many actions taken by the French government to develop data banks, networks, and the improved use of technical and economic information on many fronts in France. The Nora document does not minimize the importance of STI and other forms of information; it is openly preoccupied with what it considers the higher ground of telematics. In this sense, the Japanese White Paper is a much more complete analysis and synthesis of what needs to be done in the Information Age. This is less a criticism than a comparison. The Nora approach is to seek for solutions to crises being experienced by the French Republic. that are deep and perplexing. In his Introduction, Nora writes:

> Each technological revolution in the past has brought about an intense reorganization of the economy and the society. A technological revolution may simultaneously offer the opportunity for a crisis and a means for overcoming it, as was the case with the coming of the steam engine, the railroads and electricity. The computer revolution will have more far-reaching consequences, The computer is not the only technological innovation of recent years, but it does constitute the common factor which opens the door to and accelerates all of the others... Data processing was elitist, the prerogative of the big and the powerful. Henseforth, mass computerization will take hold, feeding technological advances... (Telematics) opens radically new horizons. Means of communication have certainly not been structuring communities not only in our day. Roads, railways and electricity are all only steps along the way to family, lodal, national and multinational organization.Unlike electricity, telematics will not transmit an intert current, but will convey information, i.e., power...In varying degrees, telematics will affect all of the long and short-term apects of the French crisis... Our traditions stand in the way of initiative and adaptabllity required by a society based on communication and participation. Only a deliberate policy of social change can voth solve the problems raised by telematics and utilize its potential...

Nora is quite frank in what he sees in his exploration. He says that France will have to take into account the renewal of the IBM challenge. He sees IBM, once a manufacturer

of machines, about to become a telecommunications administrator, controlling its own communications network, and about to encroach upon a traditional sphere of government power, communications. In the absence of a suitable policy, he goes on, a twofold alienation will develop, involving the administrator of the network and the American data banks, to which it will facilitate access. In his view, government action is needed. To improve France's position in a relationship of forces with competitors not under her sovereignty, the authorities must make unrestrained use of their trump-card, which is to decree. He writes:

> The only cartel capable of establishing a dialogue with IBM is one which could be formed from an alliance of telecommunications agencies. The basic task of the authorities, then, is to strengthen the French membership in this association...

From an American perspective, the fixation of the authors of the Nora report on the power and portent of IBM may be overdrawn, unless one recognizes that in other countries (not to exclude IBM's competitors in the United States), IBM has become a "metaphor" - a symbol and a rallying cry for counteraction. There is more than a strong possibility that the IBM authorities have, on reading the French Report, tempered their intoxication with the implications of its future power with the recognition that the Nora characterization is a caricature of the reality, one that neglects to mention the existence of American Telephone and Telegraph Co.,on one hand, and the United States government on the other. More cynical observers are apt to remember how the launching of the Soviet Sputnik was used to stimulate the space activities of the United States, as well as science and technology support by the Federal government.

The Report, its annexes and its supporting documents are the work of many experts in France. The hundreds of pages of input blend philosophic contemplation, prediction of technological trends, discourses on information geopolitics, reporting of technological and national developments, impact of telematics on governments and other institutions, expected contributions to productivity, effect on workers and other manpower, the affect of information technology on centralization and decentralization of governments and power, how information science contributes to power games,

the effect of computerization on the medical professions and teaching, the absence of a unified strategy, the role on service companies and information technology performers, data processing for administration, the expectation of culteral conflicts, and the consequences of regulation without planning and planning without regulation. All in all, what is called the Nora-Minc Report is a mountain of analyses, conclusions and recommendations written with Wagnerian gravity and gallic eloquence. It is an effort to acquaint the heads of government with a warning that to pay little attention to the forces of the new information technology is to court disaster. It is an exercise in introspection, an imaginative essay on how the individual and the state will fare as the Information Age envelops them.

The Japanese White Paper accepted the arrival of the Age of Information and its portent for the future, and then went into fine detail on how all of the institutions in Japan in both the public and the private sector should organize themselves in a cooperative posture to the year 2000 and beyond. The shape of the problem seen called for a blueprint for action. Pragmatists as the Japanese leaders are, there is less time for creating a vast new literature exploring in fine detail ideas and principles stimulated by the Information Age and new information technology pouring out of laboratories and factories. Here is a sampling from the Nora Report that underscores the difference in outlook:

> The cultural model of a society also rests upon its memory, whose mastery largely conditions the hierarchy of powers. Access to infinitely greater sources of information will entail basic changes and will affect the social structure, by modifying the procedures to acquire knowledge. With remote data processing, the storage of information changes in size and in nature. Storage in computers requires an organizational effort based on both technical constraints and fin ancial imperatives. The establishment of data banks is going to be the beginning of a rapid restructuring of knowledge, following patterns which now are difficult to define. The change will take place on the initiative of the sponsors of such banks, and most probably in the United States. Therefore, criteria originating from the American cultural model will prevail. Thus, data processing runs the risk of being the source of one of those discontinuities around which knowledge revolves. The boundaries of disciplines will be more fluid, more mobile, because they will be the result of multiple codifications, of isolated attempts, without direction or design. Related primarily to the nature of data banks, this evolution will thus reflect the influence of American culture, which is not organized into an army and does not found corporations. The multiplication of configurations will reduce the importance of unifying classifications: know-

> ledge will then lose the comforting support of a tradition and of a sociology. Will it gain from it an ounce of freedom? Data processing will also revolutionize an individual education mainly consisting in the accumulation of punctual knowledge. Then, discrimination will be based less on the storage of knowledge than on the ability to research and use it. Concepts will prevail over facts, iteration over recitation. Accepting this transformation will constitute a Copernican revolution for pedagogy.... All changes in knowledge are accompanied by social changes: the rise of the middle class was simultaneous with that of the book, the appearance of the technocratic classes with the development of the economy, of sociology, of psychology, that is, of the new disciplines which enriched the methods of exerting power. The remote data processing revolution will have consequences which cannot be evaluated at the present time.Actually, one should have a very static concept of social change to regard it as a "game of goose", in which one group would withdraw by some squares and another group would advance by some squares known in advance....

Agile rhetoric and McLuhanesque "probes" are found in considerable number in the Nora Report. Whether the predictions are accurate or not, the reader can gain considerably by exposure to this unusual document that adds much to the literature and that certainly has an effect on the French government. Here are a few items from the literature that reveal how France has responded to the Nora and other calls for action:

> Thanks to a Japanese inspired government procurement strategy, France's Alcatel-Electronique is preparing to flood U.S. and European markets with thousands of small cheap data terminals...The basis for the attack is the choice of Alcatel by the French government postal and telecommunications authority (PTT) to provide the first 300,000 terminals for the PTT's new electronic telephone directory project - apparently the largest home-use terminal order ever placed in the world...The PTT's program is ambitious to equip each of France's 30 million telephone subscribers with a free terminal by 1992...
>
> --Business Week: May 11, 1981, p. 46.

> The great national colloquium last week on the state of science in France was sometimes like a high mass, sometimes more like a giant committee meeting...M. Jean-Pierre Chevenement, Minister of State for Science and Technology, told the sesson that the higherst authrorities of state have decided that scientific research is vital for the successful change and future of our country...The Minister developed the theme that French science must increasingly be seen to be French. He promised data banks and scientific books in French and that the great international science journals would be translated.
>
> --Nature (U.K.): 21 January 1982, p. 180.

> The government of France, hoping to create a NASA of the media age, today is expected to reveal details of a multimillion-dollar "world center" to design personal computer systems for education and training in industrialed countries and the Third World. Jean-Jacques Servan-Schreiber, will be named chairman of the Center. The first director will be Nicholas Negroponte, a professor of computer graphics from M.I.T.
>
> --Michael Schrage, Wash. Post, 27 Jan.1982

France is also making strong efforts to stimulate its electronic industry in recent years, but it is having difficulties due to the recession that has laid hold on all of Europe. In the meantime, problems have befallen the "world center" to help the developing countries, Negroponte has expressed his unhappiness about some of the developments or lack thereof in the world center. Some of the difficulties encountered by the center deal with the difficulty of obtaining funds. At the outset there was an expectation that petroleum-exporting countries like Saudi Arabia would help financially, but these countries have fallen on more lean days. But there is hardly any doubt that the Nora-Minc Report on the computerization of society will continue to have a strong effect on France in the future.

WHALEN-JOYCE (Mitre Corp.) REPORT [1]

One of the contributions of these two very knowledgeable authors is the literature survey that they undertook. A total of 95 documents identifying a variety of past national studies, legislative documents, journal articles and "white papers" were analyzed. Most of these papers focused on STI, but some refer to the legislative history of the laws pertaining to Federal government STI. As they wrote, "Some of the documents deal with STI in depth while others deal with it only on a cursory level." Of the Report's 68 pages, 41 are devoted to a bibliography divided into four parts, containing (1) primary non-legislative publications, (2) primary legislative publications, (3) other non-legislative references, and (4) other legislative references. In short, scholars and students interested in deeper penetration of the subject of Federal STI will find material of considerable value in the Whalen-Joyce paper. A three-pages executive summary makes a valuable contribution to those who are devoted to economy of reading.

Given top billing in the report was the then recent establishment of the Office of Science and Technology Policy in the Executive Office of the President. The authors point to this development as evidence of a growing concern "that issues relating to scientific and technical communication need attention at the highest levels of government." The authors quote Public Law 94-282, the National Science and Technology Policy, Organization and Priorities Act of 1976 which establishes a broad Federal policy with respect to STI, namely:

> It is the responsibility of the Federal Government to promote prompt, effective, reliable, and systematic transfer of science and technology information by such appropriate methods as programs conducted by non-governmental organizations, including industrial groups and technical societies."

The law also reflects the Federal Government's responsibility:

> ...not only to coordinate and unify its own STI systems, but to facilitate

[1] Whalen, Bruce G. and Joyce, Charles C. Jr., Scientific and Technical Information: Options for National Action, Prepared under contract for the Division of Science Information, National Science Foundation, The Mitre Corporation, Metrek Division, McLean, Virginia, November 1976, pp 68.

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> the close coupling of institutional scientific research with commercial application of the useful finds of science.

The authors then reveal one of the weaknesses of the law, a weakness that became evident with the passage of time, with this comment:

> The law does not, however, establish mechanisms to deal with STI concerns. Instead a President's Committee on Science and Technology will be established to conduct a comprehensive, two year survey of all aspects of Federal research and development, including STI.

Perhaps no deeper study of Public Law 94-282 and its concern for STI matters has been made by any writers before or after the work of Whalen and Joyce. Amazingly, they found that the law references STI or has language related to the dissemination of research results in 11 of its 45 major sections. There are five titles in the Act. The first four have references to STI. Title V deals only with matters pertaining to authorization and statutory repeal of other acts. Because the performance of the Office of Science and Technology Policy in the STI area is one of the chief concerns of this book, the specific references found by Whalen and Joyce are repeated:

Title I	- Section 101 (b)(1) - Section 102 (a)(5)(C) & (E) - Section 102(b)(2) - Section 102 (b)(4) - Section 102 (c)(10)
Title II	- Section 205 (a)(3) -Section 205 (b)(1)(B) - Section 208 (a)(4)
Title III	- Section 303 (a)(2) - Section 303 (1)(4)
Title IV	- Section 401 (e)(3)

They point out that:

> Most of the STI-related language in the law is in Title I, Findings and Declarations of Policy. In particular, "improved management of information; is stated as one of the basic principles of national science policy. Further, the implementation of such a principle requires that the Government ensure transfer of technology information to users and facilitation of a close coupling of industry and academia in the application of scientific findings. The implementation also included cooperative scientific and technological relationships with states, local governments and the private sector.
>
> The thrust of the policy principles in the law, as regards STI, is to recognize the importance of the STI mechanisms now in operation as part of a national technical information system, and to define its goals and purposes, and to acknowledge the Federal Government's

> responsibility for participating in it. Such participation is defined as including: the generation and supply of information from Federal programs of science and technology, the funding or support of various parts of the total national system, and the encouragement of cooperative working relationships among the different parts of the system. The organization established by law, however, provides no specific mechanisms for dealing with STI, with the exception of the Committee which will address STI issues as part of its two-year survey.

The authors wrote that OSTP was in the position of either initiating action in the STI area to assist the survey effort, or deferring action until the Committee completes its work. They state that one reason for the Mitre study contracted for by the NSF Division of Science Information was to review PL. 94 - 282 and other major studies to identify those recommended courses of action which OSTP could take to deal with such concerns. What the two authors did not anticipate was that the President's Committee on Science and Technology would not complete its two-year term and the Office of Science and Technology Policy found it expedient to give low priority to STI matters, contrary to the spirit of the enabling legislation that brought OSTP into being.

Figure 2, A Summary of the Major STINFO-Related References in the National Science and Technology Policy, Organization and Priorities Act of 1976, prepared by Whalen and Joyce, is reproduced on the next page.

An analysis of Congressional documents prepared over the past two decades brought forth several common views: STI is very important. It is an integral part of R&D and the principal means through which the findings of research are translated into useful applications for the well-being of the nation. STI is big business and stakes are high. A King Research, Inc. report [1] found that the total resources expended in STI in the U.S. are estimated at $9.4 billion in 1975. The figure includes the costs incurred by authors, publishers, libraries and secondary sources, and users in the production and use of STI in books, journals, reports and other publications. Severe

1 King Research, Inc., Statistical Indicators of Scientific and Technical Communication,-(1960-1980), Volume I: A Summary Report, October, 1976, page 13.

FIGURE 2
A SUMMARY OF THE MAJOR STINFO-RELATED REFERENCES IN THE NATIONAL SCIENCE AND TECHNOLOGY POLICY, ORGANIZATION AND PRIORITIES ACT OF 1976 (PUBLIC LAW 94-282)

TITLE I

NATIONAL SCIENCE, ENGINEERING, AND TECHNOLOGY POLICY AND PRIORITIES (FINDINGS AND POLICY)

FINDINGS

Foster leadership by enlarging the contributions of man and his universe by making the discoveries of basic science widely available at home and abroad

POLICY

Principles: Develop and maintain a solid base for science and technology including:

- effective management and dissemination of scientific and technological information
- promotion of increased public understanding of science and technology

Implementation: Federal Government is responsible for the systematic transfer of scientific and technological information by such appropriate methods as programs conducted by nongovernmental organizations, including industrial groups and technical societies

Also responsible for the coordination and unification of Federal science and technology information systems and to facilitate the coupling of institutional scientific research with commercial application of the useful findings of science

Scientific and technological activities which may be properly supported exclusively by the Federal Government should be distinguished from those in which interests are shared with State and local governments and the private sector. Among these entities, cooperative relationships should be established which encourage the appropriate sharing of science and technology decision making, funding support, and program planning and execution

Procedures: Federal organizations should establish procedures to insure among them the systematic interchange of scientific data and technological findings developed under their programs

TITLE II

National Science Foundation

Other Federal Agencies

State/Local Governments

National Security Council

Council on Environmental Quality

Council of Economic Advisors

Office of Management and Budget

National Science Board

Working Relationship

OFFICE OF SCIENCE AND TECHNOLOGY POLICY
(Director appointed by the President and up to four Associate Directors)

Member

Domestic Council

- Gather, analyze and interpret timely and authoritative information concerning significant developments and trends in science and technology
- Utilize, to the fullest extent possible, the services, personnel, equipment, facilities and information (including statistical information) of public and private agencies and organizations, and individuals, in order to avoid duplication of effort and expense

TITLE II

INTERGOVERNMENTAL SCIENCE, ENGINEERING, AND TECHNOLOGY ADVISORY PANEL
(10 or more members plus the Director of the NSF; members appointed by the OSTP Director after consultation with State officials)

- Advise and assist the Director in identifying and fostering policies to facilitate the transfer and utilization of research and development results so as to maximize their application to civilian needs

TITLE III

PRESIDENT's COMMITTEE ON SCIENCE AND TECHNOLOGY
(8-14 members to be appointed by the President based on prescribed qualifications including one person distinguished in information dissemination)

- Survey the overall context of the Federal science, engineering and technology effort and consider needs for:
  - improvements in existing systems for handling scientific and technical information on a Government-wide basis, including consideration of the appropriate role to be played by the private sector in the dissemination of such information
  - improved methods for effecting technology innovation, transfer and use

TITLE IV

FEDERAL COORDINATING COUNCIL FOR SCIENCE, ENGINEERING, AND TECHNOLOGY
(13 members, one member each from Agriculture, Commerce, Defense, HEW, HUD, Interior, State, VA, Transportation, NASA, NSF, EPA, and ERDA)

- Achieve more effective utilization of the scientific, engineering and technological resources and facilities of Federal agencies, including the elimination of unwarranted duplication

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Severe STI handling problems exist because the growth of STI and STI systems has not been guided by coordinated policies resulting in inefficiencies, potential duplication and waste causing both organizational and managerial problems. Little is being done by the Federal Government to address STI problems and concerns. The Federal Government, as the largest sponsor of R&D, should bear the major responsibility for assuring an effective national system for scientific and technical communication.

The conclusions of Whalen and Joyce were, based on all of the reports and other materials analyzed: (1) there is overwhelming testimony that STI needs are very important and need to be addressed at the highest levels of government; (2) many STI-related problems and issues have been expressed, but theire is little supporting evidence to substantiate the scope, magnitude, priorities, and direction of change of these problems; (3) recommendations regarding Federal action on STI issues have been made repeatedly over many years but little action has been taken; and (4) the Congress, with the passage of P.L. 94-282, has placed responsibility for Federal action in the STI area in the new Office of Science and Technology Policy.

Based on the foregoing, Mitre's recommendations to OSTP called for two categories of action:

1. New organizational mechanisms to deal with Federal as well as national STI concerns could be established, including:

   -- A focal point to assume responsibility for agency-wide direction and control of STI activities within each Federal Agency engaged in R&D.

   -- A Federal Agency Coordinating Group, composed of agency focal point representatives and other concerned Federal organizations, to serve as a focal point for coordination and management of Federal STI activities. It would also support the Federal Coordinating Council for Science, Engineering and Technology established under P.L.94-282.

   -- An Information Policy Board, composed of representatives from the major Federal agencies involved in government-wide policy research and policy development relating to STI. Mentioned were OSTP, the Office of Telecommunications Policy, and NSF's Division of Science Information. The Board would recommend policy for Presidential approval and Agency implementation. The Board would be supported by one or more advisory committees representing the 'stakeholders' in the public and private sectors.

2. The need for further study of the STI area has been repeatedly expressed. Past major studies tend to express needs for action based on informed opinion and do not, on the whole, offer statistical or anecdotal evidence to substantiate the rec ommendations offered. OSTP should initiate actions to obtain more concrete data on the Nation's STI enterprise and more contemporary information on key STI issues. Areas for consideration include:

   -- Compiling a body of data on the structure and economic parts of the nation's STI enterprise for use by the OSTP and other concerned organizations.

   -- Reviewing current Federal STI policies and developing recommendations for formulation of improved policies.

   -- Investigating the desirability of further centralization of Federal STI activities.

   -- Assessing the issues related to standards and/or compatability of Federal STI systems.

   -- Evaluating the current effectiveness of the major Federal STI systems.

On the whole the Mitre Report was a good report that deserved much more thought than it got. Undoubtedly, much more attention would have been given it,if (1) the President's Committee on Science and Technology had survived; (2) the leaders in OSTP were convinced that Federal STI matters deserved their attention, i.e., merited higher priority; (3) NSF had not abandoned its science information program,turning its back on legislative responsibilities despite Congressional admonitions; and (4) there was an organized STI community "out there" in the public and private sectors powerful enough to convince OSTP that failure to strengthen Federal STI programs and coordination of the public and the private STI sectors would be injurious to the health of U.S. science and technology. One criticism that could be made of the recommendations was the failure to call on OSTP to place an experienced STI scientist/manager in charge of the overall program. Another criticism was a failure on the part of the investigators to carry on a dialogue with the Federal STI managers to receive an updated picture of what was happening to the once-strong agency programs. Finally, some criticism could be made of the lack of study of the accomplishments and failures of the Committee on Scientific and Technical Information (COSATI), Federal Council for Science and Technology, that held sway during the 1960s.

GELLMAN-CHASE-MOGDIS CRISIS INFORMATION REPORT [1]

For some time, before the contractors were given a contract to undertake the study, the Division of Science Information research managers were asking the tough question: how effective and how sensitive are the discipline-based and mission-based information systems in the public and the private sectors in serving the broader information needs of those public servants and their private sector counterparts who are involved in crisis management and crisis aversion programs? How were the many and diverse streams of data and information that were needed to serve crisis managers brought together in the requisite form and timing to make their proper contribution to solutions? How were these managers succeeding in blending scientific, technical, economic, political, sociological, psychological and other kinds of information together to focus on finding answers and precipitating action? What were the prospects of achieving standardization and compatability of data bases in machine-readable form that would facilitate and accelerate the work of the crisis managers and problem solvers? How central is scientific and technical information in making key decisions? What problems dealing with information and data were being reported by those responsible for crisis management and what steps were they taking to solve them? What help could information scientists and managers involved with scientific and technical information program development and management provide currently and in the future? These were the concerns that resulted in awarding the contract to the two contractors, recognizing that at best they could only come up with partial answers, also recognizing that the solution of crises is not always dependent on STI and other information needs.

There was another reason why this study had to be undertaken. It deals with directions for the public and private STI sectors. With an exception here or there, it was the Federal STI community during the 1960s, encouraged by a sympathetic Congress and Executive Office of the President, that moved rapidly towards the development of STI programs and systems, featuring state-of-the-art information technology and more

[1] Gellman Research Associates, Inc. and Chase-Mogdis, Inc, The Role of Scientific and Technical Information in Critical Period Management. Prepared for the Division of Science Information, National Science Foundation under contract, May 1977, 2 volumes. Vol. I (135 pages) and Vol. II (Case Studies, Appendices, etc. 300+ pages)

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aggressive information delivery systems, some operating on a global basis. It was the Federal STI community early on during the days of COSATI that recognized that eventually other information systems had to be developed that would parallel the progress made in the STI field. Encouragement was given to developers of other kinds of information systems. The list of members and observers of COSATI expanded to make this possible. Early recognition was given to the need to improve information systems for problem-solvers, crisis managers and other executives who had to depend on diverse sources of information. In effect, the early Federal STI pioneers recognized that the notion of STI systems as stand-alone programs forever to be partitioned off from other technical and management information systems was a fallacy. The willingness of NSF's Division of Science Information to explore the resolution of domestic crises and their information needs is yet another indicator of the contribution of those who were responsible for that program.

The contractors fully understood that theirs was an exploratory role, since the field was hardly marked by previous efforts. What they were looking for were new insights and hypotheses to be used in future studies. What they found is included in this coverage of key studies and reports because it broke new ground and should therefore receive such recognition. The method they chose to conduct the studies included the preparation of four ex-post case histories of domestic crises: the Penn Central bankruptcy, the Oil Embargo of 1973-4, Consolidated Edison's emergency blackout of September 22, 1970 in New York, and the Apollo 13 rescue. These were chosen because they "represent a broad spectrum of technological sophistication, information activity, and bureaucratic structure. They provide a means of comparing the use of "space age" as well as 19th century technologies with the existing communication channels of each organization."

The principal conclusions reached by the authors were as follows:

1. Existing channels of communication during crisis periods will not accommodate new forms of information.

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2. Internally generated STI is the predominate form of information which is transmitted during crisis periods.

3. The predominate information need during the initial response to a crisis is applicational. Nutritional information is generally employed during the monitoring and feedback elements of the crisis process.

4. The flow of information during a crisis is generally horizontal. Vertical flow is limited to middle management interaction, with designated authority for crisis decisionmaking, and those individuals in lower levels of the organizational hierarchy.

5. The institutions whose services and products derive from the sophisticated technologies of the mid-20th century tend to be proactive, i.e, they tend to plan in advance for failures by preparing contingency plans, including formal communications procedures for crises. In contrast, organizations that are reactive to the onslaught of a crisis tend not to have emergency procedures or plans to mobilize and move STI.

6. The availability of STI and associated infrastructure does not ensure its use. Further, the use of STI even when it provides the knowledge apparent for a solution does not indicate that success will be achieved.

7. In a technologically sophisticated bureaucratic structure, the number of communication channels available during a crisis is either held constant or increases.

8. In a bureaucratic structure where either units are competing or a central focus in the hierarchy is not present, the existing channels are not adequate to support or direct information flow during a crisis.

9. In crisis, where a central focus in the hierarchy is absent, ad hoc groups and channels of communication are constructed to achieve reliability in behavior.

10. Bureaucratic structures which prepare operational contingency plans develop communication channels which minimize information overload.

11. Communication channels which are developed based upon normal operating procedures and contingency plans, have capacity which exceeds typical demand.

12. Where a central authority does not exist in a bureaucracy during crisis, the volume of communication increases to decisionmakers because a polarizing structure is not present.

13. The most important factor in enhancing decisionmaking during crisis is effective communication channels developed consistent with the intent (or purpose)of the bureaucratic structure, rather than its dysfunctional characteristics, and existing technology.

The authors concluded that the market for new STI products for application to crises is limited, more appropriate would be an update service designed to supplement existing data bases. They found that the potential market for new inform-

services is those organizations, particularly government, which tend to be reactive rather than proactive.

In reading the report, it is obvious that the authors spent a tremendous amount of time getting information and data dealing with the four crises that they chose to study. There is a shadow of a suspicion that considerably less time was spent in the preparation of the analysis that led to the conclusions cited above. Perhaps one reason for this resulted from the selection of the cases. Each of them was a legitimate crisis, it is agreed, but the inclusion of the Penn Central bankruptcy and the oil embargo of 1973 is questionable, since they hardly qualify as cases involving a need for scientific and technical information in any major way. The other two cases - the electrical brown-out and the Apollo 13 incident - were better selections,but once again the need for STI could not have been a major need. The authors disagree with this observation, since they state that in the Apollo XIII and Consolidated Edison cases scientific and technical information were the predominant need. They concede on page 57 of Volume I that there was no STI need in the Penn Central case and in the oil embargo case, no clear predominance of any class of information was found. Since they recognized in the title of their paper - The Role of Scientific and Technical Information in Critical Period Management - that STI was the subject of the inquiry, all of the cases should have involved crisis that clearly involved the need of STI for a solution. This observation does not undermine the study report, but it does open a question about the observations about STI in the conclusions. It does underscore the need for more exploration with a more careful selection of cases. For example, the electrical brown-out and the Apollo cases called for immediate solutions. The oil embargo problem was one of longer duration, but the difficulty was the arrestation of flow primarily. Today, living during a period of an "oil glut" and quasi-abandonment of the drive toward synthetic fuel research and development, there is further question about real STI need during the period of acute discomfort and "crisis." Future researchers in this very important information area

might want to look into such areas as: the thalidomide, saccharine, DDT,tylenol and other health crises; environmental areas such as:off-shore oil drilling spills, ground contamination by pesticides and other chemicals, pollution of streams, and the affects of aerosols on the ozone layer; and computer security and fraud, perhaps. If one examines what is happening in Congress daily, it is easy to find problems, some of these might qualify as "crises" that require all kinds of information, including STI. In many of these "cases," it is recognized that solutions are not going to be easy to find in the short haul.

Future research work in this area might be undertaken in fields where the solutions will have to be sought on an international basis, because the problems that are perceived in the United States are probably just as evident in other advanced countries.

Research funding agencies should be encouraged to make a reasonable amount of investments in the crisis management-crisis aversion field. Unless new information technology and techniques can be applied to help solve crisis and major problems, we may find that the progress we hope for as we enter the Information Age more deeply is a chimera or a leaden Grail. The ice has been broken, we ought to plunge in.

ADAMS REPORT [1]

The Adams Report reviews a number of critical issues in scientific and technical information as seen through the eyes of information users, providers and policymakers. They were determined in three national conferences by approximately 350 information experts who participated in the workshops and conferences held in Boston (Users' Perspective Conference), San Francisco Area (Providers' Perspective Conference) and Washington, D.C. (Policymakers'Perspective Conference). The National Forum on Scientific and Technical Communication was the first widely-based symposium to focus on the subject and the needs for improved communication. The three conferences were taped, including the workshops. These data added to workshop presiders' notes along with data from completed questionnaires that were completed by the participants gave Dr. Adams a mass of useful empirical data she used in preparing the report. An analysis of the material obtained at the Users and Providers meetings resulted in clusters of problems and issues. The author reports that five problem groups and sub-groups emerged as a "natural" organizing framework for the data collected, problems: in accessing STI, caused by a lack of delineation of roles and responsibilities, requiring new functional activities in scientific and technical communication, caused by a lack of centralized planning, and caused by or resolved by economic factors. In her Foreword, Adams states:

> Among the key participants in the scientific and technical communication process, there is consensus on the need for coordination of STI activities and resources of the nation. There is a need, also, for coordination of existing legislation dealing with information and for a focal point to provide an on-going assessment of information policy.

In the Introduction, the author writes about the National Science and Technology Policy, Organization and Priorities Act of 1976 (P.L 94-282, which brought the Office of Science and Technology Policy and the President's Science Advisory Committee (PSAC) into being. She mentioned the fact that one of the members of PSAC was to be an expert in information dissemination. But she ruefully writes: "The task force assigned to the area is not functioning at this time." This was more than a year after the passage of the act. Recognizing this fact and the need for more effective evaluation of the nation's scientific and technical communication system the NSF Division of Science Information contracted with George Washington University "to explore the critical issues facing STI activities in the United States, emphasizing the prospective roles of the public and the private sectors." Only a few years later, Elizabeth Byrne Adams prematurely

[1] Adams, Elizabeth Byrne and Rood, Sally A., Critical Issues in Scientific and Technical Communication: Perceptions of Users, Providers and Policymakers, National Forum on Scientific and Technical Communication, Science Communication Division, The George Washington University, Research supported by NSF Contract, 1978,pp 124.

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passed away, leaving this report as a memorial to her contributions to the STI and fields where she labored so diligently and selflessly.

Let us list what she found in more detail. These are the problem areas that drew consensus:

1. Access to Scientific and Technical Communication
   a. Inability to identify the "universe" of STI.
   b. Inability to locate specific information within this unidentifiable "universe."
   c. Unavailability of specific subject information, categories of information, and particular databases especially with regard to interdisciplinary subjects.
   d. Inability to locate and obtain documents.
   e. Inadequacy or unsuitability of dissemination mechanisms to the many individuals who are potential users of STI.
   f. Delays in accessing reports of recent research.
2. Economic Factors Interfering with Scientific and Technical Communications.
   a. Cost barriers preventing access to users and institutions.
   b. Lack of financial support for improvements in the scientific and technical communication system, to the development of regional networks, and to institutional budgets.
3. Delineation of Roles and Responsibilities in Scientific and Technical Communications
   a. Lack of delineation of public/private roles and responsibilities resulting from unfair competition, unequal performance, duplication of effort and variety of database structures and pricing polies.
   b. Failure to develop policies for interfacing systems and networks, minimizing duplication among these and preventing overlapping of present legislation governing information.
   c. Failure to establish responsibility for international activities in scientific and technical communication resulting in unequal transfer of information and difficulties in identifying and accessing foreign STI.
   d. Lack of coordination of Federal activities resulting in redundancy, different policies, uneven standards of dissemination, low quality of information and access problems.
4. Requirements for New Functional Activities in Scientific and Technical Communication
   a. Indexing and classification systems for compatability and to facilitate searches.
   b. Education of users, providers and organizational managers as the use and value of STI.
   c. Standardization of descriptors, languages and database structures.
   d. Quality control, reliability assurance, analyses, evaluation and translation.
   e. Research in user performance and technological developments to facilitate user communication systems.

5. Requirements for Centralized Planning for Scientific and Technical Communication
   a. Centralized planning for the collection, storage, integration and dissemination of STI for scientists, citizens, decisionmakers and policymakers.
   b. Centralized planning to forecast future requirements for STI and to integrate these with other classifications of information.

The general recommendation that came from the interaction called for the establishment of a focal point in Federal government for information policy. This office would be responsible to:

   a. Analyze and develop a single common classification, handing, processing and access methodology for the presently fragmented STI systems. As the largest integrated system in the nation, it would provide leadership for the development of a national public/private scientific and technical communication system oriented towards: scientists in disciplinary research, problem-oriented multidisciplinary research and policy research and analysis.
   b. Provide an on-going assessment of the generation, utilization, maintenance and dissemination of information of all kinds -- that is, STI and social and economic information.
   c. Establish policies and guidelines for the development of STI systems oriented toward user needs.
   d. Coordinate existing legislation dealing with information and recommend new legislation.
   e. Plan and coordinate existing STI activities and resources toward a network of organized, hierarchical information accessible to different users.

Specific recommendations covered the improvement of liaison and interaction with information users, identifying and improving the content of STI, improving the interactions and the systems of all STI providers and those who generate new knowledge, and to more aggressively encourage technology utilization. Readers are encouraged to study the specific recommendations in more detail than can be covered in this summary.

Readers will not find anything dramatically new in the problems, general recommendation and specific recommendations. After all, the nature of the forum process and the search for consensus would tend to play down more unusual or extreme contributions. There is another part of the report, a list of selected questionnaire responses that were included by Adams and Rood. Some of these did not fit easily into some of the above. Examples are presented as follows:

> "I believe there is not enough access to STI for the public. In an adversary society there is an inability to find and use information for decisionmaking."

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"The nation's STI services primarily deal with published materials... which is usually several years old or more. To really be effective, they should also deal with unpublished materials and other sources, as leading-edge institutions or innovative consultants, experts or practitioners."

"...actual document availability is a major problem."

"The shibboleth of the "test of the marketplace" and the significance of revelence are the greatest barriers to the adequacy of STI services."

"A large part of the scientific and technical community is overlooked, for example the design engineer. It is necessary to broaden the concept of STI beyond its traditional boundaries - a messy problem, because such information is scattered, diffused, non'standardized, and unorganized."

"I do not believe it would be feasible to unify or consolidate Federal STI systems but certainly a higher order of coordination should be attempted." "Coordination and networking is preferable to centralization."

"NTIS and GPO overlap communication is needed, but not consolidation."

"Present systems need not be consolidated but the establishment of a National Information Agency would be an effective start. Such an organization would go beyond the present NTIS and not only act as a hard copy distributor but also provide reference and referral service exclusively on STI."

"Provide some sort of system like the fourth class postage for books to help cut the cost of information dissemination, for instance, special rates of postage and telephone and data communications for STI.

"Supply $$$$ to potential users in societies and non-government groups. Maybe a voucher system for citizens would help, so that every citizen shall, yearly, have $1,500. for database access through their local public or special library."

"Hold hearings on the Federal role in national and international information systems."

There are 13 pages of these responses. We are indebted to the authors for including them in this thoughtful report that took so much work to produce and contains so many valuable insights. Segments and types of workers in the STI and related fields would learn much from this report which received so little attention not unlike the others in this section of the book. It is a unique report. NSFshould be congratulated for commissioning it and encouraged to follow up on it.

GIULIANO -ERNST REPORT [1]

The Arthur D. Little, Inc. Report was one of the series of studies undertaken at the request of the National Science Foundation to explore the needs and problems of science communications in the future. Serious soul-searching was going on during this period by information scientists, information managers and information policymakers. Federal and national research and development continued to grow, literature and data resulting from the investment likewise. The increase in the number of scientists, engineers and other personnel continued. Agreement at that time was that we were indeed a Post-Industrial Society with information as a most rapdily growing centerpiece of that society. Information workers of all kinds were proliferating as reflected in Bureau of Labor Statistics. Yet, the leaders in the scientific and technical information area in the Federal government recognized that they were losing the support of the agency R&D managers. The Executive Office of the President, knee-deep in information problems and issues, showed little or no interest in STI matters in spite of continuing, though muted, congressional unhappiness and pressures. Information vendors in the private sector began to increase, but there was no presence in the Executive Office of the President to help them or their counterparts among the Federal agencies search for ways and means to pool their efforts and energies in the common good. Scientists, even those that played a key role in creating the Federal STI programs in the 1950s and the 1960s, were passive regarding STI. That there was something wrong was patently clear to the STI leaders in and out of the government, recognizing that the hiatus implied future danger to American science and technology. Fortunately, the NSF Science Information Division was still in business in that organization - it was to disappear not in the distant future - and interested in charting new directions while evaluating current difficulties. It was also fortunate that Drs. Vincent Giuliano and Martin Ernst, two very knowledgeable information experts, became interested in the

[1] Giuliano, Vincent J., Ernst, Martin, Crooks, Susan, and Dunlop, J., Passing the Threshold into the Information Age - Perspective for Federal Action on Information, Prepared by Arthur. D. Little, Inc., Cambridge, Mass. and Supported by NSF Grant, January 1978, PP 200+ (Text and Appendices) (Note: Review made from last draft prior to printing.)

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problem and the need for a solution. They received considerable help from their associated Crooks and Dunlop in what was more then only a work assignment. Two contributing consultants, distinguished in their own right, Joseph Becker and Anthony Oettinger, jointed them as contributing consultants. Very wisely this team started its efforts with a series of meetings with the principals involved in Federal STI matters to get directly from them a first-hand account of what they perceived as the problems, issues and challenges facing the STI community. They also met with knowledgeable congressional experts; Robert Chartrand of the Congressional Research Service - whose interaction and guidance has been a monumental contribution for more than two decades - was one of them. As a result of these meetings, the interaction with Federal and congressional and other experts, and their own considerable knowledge of the Federal STI scene and built up during the preceding years, the authors, after screening and analyzing all of the facts and evidence, prepared their conclusions and recommendations.

The words of the authors regarding the genesis of the study are pertinent:

> STI is not a matter that attracts much attention or generates much excitement except perhaps for those most directly involved. We have been concerned from the start that the very title and context of our grant study effort is apt to induce a vast ho-hum reaction among those who are familiar with the long list of recent and current studies associated with this area, with the indifference with which their repeated recommendations have been received, and with the low priority this topic seems to have in the minds of our national policymakers. Yet, we requested the grant because we sensed that the stakes involved are significant, including applicability of the knowledge that results from the some $38 billion spent in the United States annually for R&D --and because we sensed that it was nearing time for a basic change in perspective associated with the increasing importance of information in all aspects of our society.
>
> To the first question, we have come to believe that the answer is a resounding "yes", that the stakes for the public, our society, and our survival in this problem-ridden area can be very much impacted by the presence or absence of major policy changes with regard to the flow of information. However, for this purpose STI is itself incomplete as an organizing principle; we have had to define the domain of concern as significantly broader than the traditional domain of STI to arrive at this perception, and a great deal of our effort has been concentrated on finding an appropriate framework in which to consider the issue of information flow.
>
> We can summarize the situation by observing that we are passing the threshold into the Information Age. With over half the working popula-

> tion engaged in information-handling activities, there is no turning back. Yet the institutions of this age that will enable effective harnessing of the objective information that exists to solve the problems and challenges at hand are only beginning to emerge...
>
> To the second question--what could or should reasonably be done and how--the matter is much more difficult. It has been easy for us to point to areas of serious difficulty and come up with many generic and even specific recommendations....It is quite another matter to provide recommendations that will in fact be followed. Implementation of a consultant's recommendations requires a client that is aware, ready to act, organizationally capable of doing so and in possession of the required resources to move forward. There is no such client actively involved today, although we expect that in time the public, with Congress as its main policymaking agency, will become so. Achieving the necessary changes will require a slow and profound process of development in awarenesss as to the meaning and value of information, and basic change in information habits and information institutions.

Having recognized that a new organizing principle is required to solve the problem of the effective flow of information, while at the same time acknowledging that change will come hard and slow, the investigators then figuratively roll up their sleeves and tell what they did and found. First, they set forth these objectives, which were to:

1. Suggest an approach to Federal STI policy planning and decision-making that would be more complete, rational and systematic that will better reflect the multiple goals of the agencies involved and those of the U.S. public and the information-handling and using communities.
2. Identify events which would facilitate such a planning process (such as creation of new interagency committees, etc.)
3. Identify key barriers to more rational planning, and how they might be removed or bypassed.
4. Identify appropriate foci of leadership for such a planning process.
5. Suggest formulations of STI issues that facilitate resolution of conflicts that might otherwise tend to freeze action.

At the outset, the investigators had to ask the question whether or not there is a problem and the value of addressing it, also why repeated investigations of prior studies have not been acted upon, and even if the problem is worthwhile could anything be done to achieve progress. In posing these questions, the authors found that what was initially needed was a simple, contemporary conceptual framework for comprehending the topic in terms of today's realities and priorities. They then prepared what they called an essential skeletal chain of logic with basic propositions that are summarized as follows:

> There are important current and hotly contested issues areas, many concerned with application of new technology, that involved massive stakes. The problem-solving processes associated with these issue area can involved millions of people. STI can and should provide an important part of the information base used in problem-solving processes, but STI needs to be augmented with other kinds of information to provide STSI - scientific, technical and societal information-to be most useful.The direct Federal stakes in STI, as part of STSI, are highly significant. The U.S. STI available in the complex of STI services and processes is the best in the world, but STI cannot do the job alone to provide an adequate level of information needed today to solve our problems. In spite of this, STI has had very little priority for national attention in recent years. The first step is to address both high stakes involved in today's problem-solving and STI's apparatus inadequacies together by a basically new perspective about the role of STSI in our society and the role of STI in STSI. The three basic modes of STI transfer - disciplinary, mission and problem-solving - have differentiated goals, objectives, roles and functions. These need to be examined while considering the interplay of two basic change dynamics: a market economy dynamic and a Federally-centered planning and resource-focusing dynamic. Thus a basic overhaul of STI resources will be required to: preserve and modernize discipline-based information institutions; facilitate various governmental "information intermediary" roles; facilitate non-Federal public and private STSI information resource preservation and development; and sponsor research related to information transfer of a problem-oriented type.The overhaul will require more than management actions in Federal agencies. It will take U.S. Congress, key Executive Branch decision makers, agency heads, the commercial information industry, and major trade/professional associations to accomplish the overhaul. Congress will have to take the lead, also top-level Executive Branch officials, since the overhaul will require several years and considerable planning and organizational changes, including conflict balancing and policy formulation.

The study team concluded that the first task is to develop a shared conceptual perspective among key stakeholders that there is an identifiable problem and an avenue of remedy. This calls for the mobilization of leaders and professional and trade associations; increasing activities of information-conscious Congresspersons; one or more OMB circulars addressed to STSI issues; creation of fora for interactions of key parties, such as congressional hearings; and research on a variety of societal problem-solving related information transfer and utilization issues.

A second step emerges from reading the report, the requirement to address both the high stakes involved in today's problem-solving and the inadequacies of today's STI apparatus relative to the needs it should be meeting. Some of the issues that they noted during the time the study was being made included: economic well-being, environmental protection, agricultural productivity, energy availability and use, public health and safety,

and disaster prevention and control. The authors write:

> These issue areas are important in terms of actual decisions that are being made (or being delayed) within communities and specific localities, within states, on the national policy level and even with regard to international relationships. The stakes are so encompassing that they cannot be represented readily only in dollar terms. A typical local decision to allow construction of a new nuclear plant may relate to an investment potential of over a billion dollars, may easily involve preconstruction, legal, regulatory and public relations costs of $25 million to the utility, and may drag on ten years or more. The non-dollar costsinclude increased environmental radioactivity that can be converted into expected cancer deaths, remote but existent pssibilities of major disaster involving millions of deaths, possible economic penalties of energy shortage and others. A national-level decision, relating to energy for example can have economic value measured in terms of tens or hundreds of billion, and could be related intimately with issues of monetary stability, international defense, employment, and stability of the Middle East region of the world.

The nuclear energy example is cited here to underscore the problem of the bankrupt Washington State nuclear energy project and its impact that is being exposed by the news media currently. It turns out that the estimate of energy needs for the State of Washington was unworldly. Purchasers of municipal bonds that helped finance this "fiasco" are now "finding out" that the lack of reliable growth information was part of their undoing. They lacked this knowledge, nor did they have the faintest knowledge of the cost of "overruns." It may also be true that the engineering companies that built the "turkeys" lacked the necessary STI to do the job well and on time.

Obviously, the A.D. Little study has to be adjudged a "breakthrough",a new insightful way to look at the subject of STI, its stakeholders, its obstacles, and a direction that could be taken with profit. The goals and the objectives of the investigators are sophisticated, but rational. Even though they will be hard to accept and digest by those whose support is needed, they are, nevertheless, sound. The recommendations of the authors will be hard to accomplish, as pointed out by the Report. The trouble is the lack of a strong STI community, a community of scientists and R&D managers interested in STI (outside of their use of it), general myopia in the U.S. government with the exception of a cell or two in Congress, and the lack of leaders who are convinced that information matters deserve their personal interest and commitment. The rainbow' barely visible on the horizon tells us, however, the message will ultimately be learned that failure to engineer better U.S. information systems is fraught with danger